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CONVAIR ASTRONAUTICS

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RANGE SAFETY INFORMATION
FOR THE ATLAS 24E

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FLIGHT PERFORMANCE AND GUIDANCE ANALYSIS
DEPT 591-1

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CONVAIR ASTRONAUTICS

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PAGE 1

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This report presents a summary of the trajectory
information required by the FNR for the establish-
ment of the range safety criteria for the flight
of missile 24-3 from 0377-1. ()

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SUMMARY

This report and its references provide the following information about the flight of missile 24E, as required by the Range Safety Office, AFM. (See Reference 1):

- a. Reference, fast, slow, and cross-range-dispersion trajectories with impacts for premature cutoffs (Reference 1, items 2a-2k and 3g).
- b. Maximum turning capability of the velocity vector.
- c. Expected effects of destruct action on vehicle and the ballistic coefficients of the resulting pieces.
- d. Expected impact point and ballistic coefficient for each re-entering body.
- e. Impact dispersion for each stage.
- f. Conditions for burning on re-entry.
- g. Trajectory deviations beyond which the launching agency is no longer interested in the flight.
- h. Tracking equipment on board which can be used for range safety.
- i. Maximum possible down range and cross-range velocities of the instantaneous impact point during each powered stage including vernier.
- j. Maximum possible range with complete fuel consumption in all stages and optimum trajectory.

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INTRODUCTION

Missile 24E will be launched from the Operational System Test Facility No. 1 (OSTF-1), VAFB. The target area will be in Eniwetok Lagoon, 4386 n. mi. down-range from the launch pad. An ARMA Inertial Guidance System and an AVCO Mk 4 Mod 5 re-entry vehicle will be utilized.

The ARMA system will roll the missile from an initial azimuth of approximately 323 degrees to a pitch plane true azimuth of 269.17360 in the time interval from $T + 2$ to $T + 15$ seconds, where T is the time of one inch motion. ($T = 0$ for the simulation.) From $T + 15$ seconds until booster cutoff time the missile will perform a programmed pitch maneuver based on the standard E-MD pitch program attenuated by a factor of 0.97. The ARMA guidance system will steer the missile to a constant inertial attitude angle of 70 degrees throughout the sustainer phase of flight.

Booster cutoff will be initiated when the downrange component of inertial velocity exceeds 6647.8678 fps. If the booster cutoff signal is not received by 130.6 seconds, cutoff will be initiated by the autopilot back-up signal. Based on a target located at 11.44647 deg N. Geodetic latitude and 162.26619 deg E longitude, the guidance system will steer the missile to the desired vernier cutoff conditions. Vernier cutoff will occur when the value of the Arma Range Error Function (REF) is equal to zero.

The 24E reference trajectory is based upon a launch weight of 268,242 lbs and nominal values of MA-3 engine thrust and specific impulse. The nominal specific impulse values assumed for the booster, sustainer, and vernier engines are 253.23 sec., 215.46 sec., and 270.70 sec., respectively. Minimum sustainer burnout weight was considered to be 11,251 lbs.

The IBM 7090 trajectory simulation described in Reference 2 was used to obtain data for this report. The latitude and longitude values presented are geodetic values on an oblate earth based upon the DODMGS 1960 spheroid. Values of range obtained from the reference trajectory simulation are computed by multiplying the geocentric angle between the launch pad and missile (or impact) position by an earth radius of 3440.1818 n. mi. or 20,902,900 ft.

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DESCRIPTION OF DISPERSIONS

Reference 1 requests that the fast and slow trajectories show the maximum expected deviations of instantaneous impact points from those of the reference trajectory. Thrust, specific impulse, lift off weight, and pitch-program dispersions were considered, and were combined in such a way as to cause maximum deviation of the premature cutoff point.

The fast trajectory differs from the reference as follows:

1. Launch weight was decreased by 3800 lbs to 264,442 lb.
2. Specific impulse of the booster was decreased 2.06%
 $I_{sp} = 248.00$ sec. (Minimum value)
3. Specific impulse of the sustainer was decreased 1.66% (a 2σ deviation);
 $I_{sp} = 211.88$ sec.
4. Booster thrust increased 1.70%; sustainer thrust increased 1.32% (each a 2σ deviation)
5. Autopilot pitch-programmer attenuation factor was decreased 3-1/3%, from 0.97 to 0.938, (a 2σ deviation).

The slow trajectory differs from the reference as follows:

1. Launch weight was increased by 3800 lbs to 272,042 lbs.
2. Specific impulse of the booster was increased 0.486%. $I_{sp} = 254.46$ sec. (2σ)
3. Sustainer specific impulse was increased 1.66%. $I_{sp} = 219.04$ sec. (2σ)
4. Booster thrust was decreased 1.70%; sustainer thrust was decreased 1.32% (2σ deviations)
5. Autopilot pitch-programmer attenuation factor was increased 3-1/3%, from 0.97 to 1.0023. (2σ)

The nose left trajectory differs from the reference as follows:

1. The yaw gyro drifts 30 degrees per hour.

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2. Cross winds based upon a table of 1% Sisonvine Winds are included.
3. There is a 1° error in launch azimuth, to the left.
4. The target is offset 3 nautical miles to the left.

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RESULTS

Some trajectory parameters for the four cases are compared in the following table:

	Reference	Fast	Slow	Nose Left
SECO (Sec)	125.532	122.032	129.032	125.532
SECO (Sec)	303.395	276.145	323.113	303.532
VECO (Sec)	319.323	289.338	339.409	317.896
Weight at SECO (lb)	12,890	12,227	13,263	12,843
Expendable Propellants at SECO	1558.9	891.23	1934.13	1511.9
Range of Nose Cone (n.mi.)	4386.2	4385.8	4386.2	4386.3

The information requirements listed in the Summary are met in the following paragraphs.

- a. Reference, fast, slow, and cross-range-dispersion trajectories with impacts for premature cutoffs are presented in Tables III, IV, V, and VI on pages 10 through 54. Terms are defined in Table II on page 8.
- b. The maximum turning capability of the missile velocity vector is presented in Reference 3.
- c. Reference 4 presents the expected effects of destruct action on the vehicle and the ballistic coefficients of the resulting pieces.
- d. Drag data for the re-entering bodies are presented in Reference 4. Expected impact points for the nose cone, propellant tanks, and booster package for the reference, fast, slow, and nose left trajectories are presented in Table I on page 7. An intact broadside re-entry is assumed for the propellant tank.

¹The effects of severe head and cross winds are given in "Range Safety and Trajectory Dispersion Information for the 7-E OSTP-1 Vehicle," GD/A Report AE61-C165

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- e. Impact dispersion for the nose cone due to guidance errors is expected to be ± 3.6 n. mi. downrange and ± 3 n. mi. cross-range. Impact dispersion for the propellant tanks is expected to be ± 9 n. mi. downrange and ± 7 n. mi. cross-range. Impact dispersion for the booster package is indicated by the data in Table I on page 7.
- f. Conditions for burning on re-entry are not required since no claim is made that any pieces of the missile will burn completely before impact.
- g. Trajectory deviations beyond which the launching agency is no longer interested in the flight are discussed in Reference 4.
- h. The General Electric GERSIS and the Air Force IRES tracking systems for range safety will be on Atlas 2E.
- i. The maximum possible downrange and cross-range velocities of the instantaneous impact point are estimated to be:

	Down Range	Cross Range
Booster	20 n.mi/sec	13 n.mi/sec
Sustainer	150 n.mi/sec	31 n.mi/sec
Vernier	3 n.mi/sec	0.6 n.mi/sec

The above velocities are for booster, sustainer, and vernier cutoff times. The cross-range velocities result from assuming that the missile rotates 90° about the local vertical and accelerates in the cross-range direction for 1 second just before cutoff. (The likelihood of these IIP velocities occurring is extremely remote.)

- j. Maximum possible range was estimated by running the reference trajectory with this change - the sustainer continued until fuel depletion. The results were:

Time of IIP	334.16 sec.
Nose Cone Impact	0.58 deg. geodetic latitude
	144.65 deg. longitude (east)
Range at impact	3615.3 n. mi.

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~~REFERENCE~~

1. Clark, J. E. "Detailed Requirements for Guided Ballistic Missiles and Space Vehicles," Enclosure 1 of COMPMR 5100.2B, 8 September 1961. Unclassified.
2. Uythoven, A. "COMBO, A Simulation for Earth Referenced Space Flights," GD/A Report AE61-0195. Unclassified.
3. Edwards, J. R. "Velocity Vector Turn Data for the XSM-65 Missile 3E," GD/A Report AE60-0657, 10 September 1960, Confidential.
4. Greenstein, J. L. "General Range Safety Data for SM 65D/ Mercury, E, and F Atlas Flights," CV-A Report No. AE61-0473, 25 May 1961. Secret

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TABLE I

IMPACT DATA FOR ATLAS 243

- (A) NOSE CONE
- (B) PROPELLANT TANKS
- (C) BOOSTER PACKAGE

NOTE: THE FOLLOWING DATA ARE BASED ON ATMOSPHERIC RE-ENTRY AND AN OBLATE MODEL OF THE EARTH

		RE-ENTRY FROM (SEC)	RANGE (KM)	O.D. (DEG N)	LONGITUDE (DEG W)
REFERENCE	A	319.323	4386.17	11.4464	-162.266
	B	319.323	4341.52	11.8301	-162.918
	C	128.532	453.25	34.5167	129.743
FAST MISSILE	A	289.338	4385.84	11.4490	-162.271
	B	289.338	4346.70	11.7848	-162.843
	C	125.032	531.75	34.4132	131.321
SLOW MISSILE	A	339.409	4386.19	11.4465	-162.266
	B	339.409	4335.68	11.8810	-163.004
	C	132.032	592.597	34.5866	128.522
NOSE-LEFT MISSILE	A	317.896	4386.27	11.4035	-162.293
	B	317.896	4341.53	11.7872	-162.947
	C	128.532	452.36	34.1457	129.677
PROPELLANT DEPLETION	A	336.158	5619.34	0.5836	-144.646

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TABLE II

GENERAL DYNAMICS ASTRONAUTICS
RANGE SAFETY DATA

DEFINITION OF TERMS

TIME- TIME MEASURED FROM 1-INCH MOTION.

RXD- MISSILE POSITION COMPONENT ALONG THE X-AXIS.

RYD- MISSILE POSITION COMPONENT ALONG THE Y-AXIS.

RZD- MISSILE POSITION COMPONENT ALONG THE Z-AXIS.

VXD- THE COMPONENT OF MISSILE VELOCITY RELATIVE TO THE EARTH
ALONG THE X-AXIS.

VYD- THE COMPONENT OF MISSILE VELOCITY RELATIVE TO THE EARTH
ALONG THE Y-AXIS.

VZD- THE COMPONENT OF MISSILE VELOCITY RELATIVE TO THE EARTH
ALONG THE Z-AXIS.

VELOCITY- THE MAGNITUDE OF MISSILE VELOCITY RELATIVE TO THE
EARTH.

FLT. PATH ANGLE- ANGLE BETWEEN THE VELOCITY VECTOR WITH RESPECT
TO THE EARTH AND THE LOCAL GEOCENTRIC HORIZONTAL.

RANGE- THE PRODUCT OF THE EARTH RADIUS AND THE ANGLE BETWEEN
THE EARTH-CENTERED INITIAL POSITION VECTOR AT LAUNCH AND THE
POSITION VECTOR AT THE POINT IN QUESTION. THE EARTH RADIUS IS
ASSUMED CONSTANT WITH A VALUE OF 3440.1818 NAUTICAL MILES.

ALT.- MISSILE ALTITUDE, DEFINED AS THE DISTANCE ABOVE THE
OBLATE EARTH SURFACE.

THRUST- TOTAL AXIAL COMPONENT OF MISSILE THRUST.

AC XI- AXIAL COMPONENT OF THRUST MINUS DRAG ACCELERATION.

WEIGHT- WEIGHT OF THE MISSILE.

GEOD. LAT.- GEODETIC LATITUDE OF PREMATURE CUT-OFF IMPACT POINT.

LONG.- LONGITUDE OF PREMATURE CUT-OFF IMPACT POINT.

FREE-FALL TIME- TIME TO IMPACT FROM POWER CUT-OFF.

DOWN-RANGE DISTANCE- THE PRODUCT OF THE EARTH RADIUS AT THE IMPACT POINT AND THE ANGLE BETWEEN THE EARTH CENTERED INITIAL POSITION VECTOR AND THE POSITION VECTOR AT IMPACT.

CROSS-RANGE DISTANCE- POSITION COMPONENT ALONG THE Y-AXIS AT IMPACT.

NOTE-

- 1.- THE DOWNRANGE COORDINATE SYSTEM (X,Y,Z) IS CENTERED AT THE LAUNCH PAD. THE POSITIVE X-AXIS IS DIRECTED DOWNRANGE ALONG THE NOMINAL FLIGHT AZIMUTH (PITCH-OVER PLANE). THE POSITIVE Z-AXIS IS UP ALONG THE GEODETIC VERTICAL AND THE Y-AXIS IS ALONG THE CROSSRANGE DIRECTION TO MAKE A RIGHT-HANDED COORDINATE SYSTEM.
- 2.- THE PREMATURE CUT-OFF IMPACT POINTS ARE BASED UPON AN IMPACT UPON A ROTATING OBLATE EARTH ASSUMING A SPHERICAL GRAVITY POTENTIAL.

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TABLE III

GENERAL DYNAMICS ASTRONAUTICS

REFERENCE TRAJECTORY
FOR RANGE SAFETY

MISSILE	243
LAUNCH AZIMUTH	269.1736 DEG. E 07 N
TARGET	GEOD LAT. 11.44647 DEG. N LONG. 162.26619 DEG. E RANGE 4386 KM
NOSE CONE IMPACT	GEOD LAT. 11.44644 DEG. N LONG. 162.26622 DEG. E RANGE 4386 KM
NOSE CONE	AVCO MARK IV MOD. 5
GUIDANCE	AIMA LOT IV
SEA LEVEL L_{sp}	BOOSTER 253.23 SEC. (NOMINAL) SUSTAINER 215.46 SEC. (NOMINAL) VARIABLE 207.70 (NOMINAL)
PITCH PROGRAM	STEP TILT X 0.97
STAGING CRITERION FOR BOOSTER	AIMA X DOT = 6647.57 FPS
LAUNCH WEIGHT (LIFT OFF)	243,242.0 LB

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NOMINAL TRAJECTORY

POWERED FLIGHT PARAMETERS

TIME (SEC)	RXD (FT)	RYD (FT)	RZD (FT)	VXD (FT/SEC)	VYD (FT/SEC)	VZD (FT/SEC)
.000	0	1	210	.00	-.00	.00
2.000	-0	1	240	-.01	.08	30.30
4.000	0	1	332	.00	.17	61.75
6.000	0	1	488	.02	.25	94.43
8.000	0	2	710	.05	.33	128.39
10.000	0	3	1002	.09	.42	163.71
12.000	1	4	1366	.14	.51	200.47
14.000	1	5	1805	.20	.60	238.73
16.000	1	6	2322	.78	.70	278.57
18.000	7	8	2920	5.23	.80	319.97
20.000	25	9	3603	14.21	.93	362.84
22.000	67	11	4373	27.88	1.07	407.04
24.000	140	14	5232	46.39	1.21	452.46
26.000	256	16	6183	69.86	1.36	498.98
28.000	423	19	7229	98.25	1.51	546.51
30.000	651	22	8370	130.60	1.63	595.21
32.000	948	26	9610	166.77	1.69	644.93
34.000	1321	29	10950	206.81	1.66	695.57
36.000	1778	32	12393	250.78	1.43	747.01
38.000	2327	34	13938	298.63	.87	798.97
40.000	2975	35	15589	350.18	-.26	850.91
42.000	3729	33	17342	404.68	-1.88	902.05
44.000	4595	29	19196	461.94	-2.22	951.73
46.000	5579	25	21148	522.11	-.94	1000.51
48.000	6686	25	23198	585.83	.41	1049.46
50.000	7925	27	25346	653.71	1.24	1099.23
52.000	9304	29	27595	726.16	1.41	1150.05
54.000	10833	32	29947	803.45	.88	1201.87
56.000	12521	32	32403	885.47	-.32	1254.77
58.000	14378	30	34967	972.17	-2.11	1308.91
60.000	16413	23	37640	1063.88	-4.37	1364.22
62.000	18637	12	40424	1161.03	-6.91	1420.73
64.000	21061	-4	43324	1263.95	-9.61	1478.36
66.000	23697	-26	46339	1372.41	-12.43	1537.39
68.000	26554	-54	49474	1486.26	-15.31	1598.23
70.000	29645	-88	52733	1605.84	-18.22	1660.68
72.000	32982	-127	56118	1731.55	-21.13	1724.64
74.000	36576	-172	59632	1863.63	-24.05	1789.90
76.000	40440	-223	63279	2002.08	-26.96	1856.69
78.000	44588	-280	67060	2146.82	-29.86	1925.19
80.000	49032	-343	70980	2298.14	-32.76	1995.22
82.000	53785	-411	75042	2456.27	-35.65	2066.60
84.000	58862	-485	79248	2621.45	-38.52	2139.17
86.000	64276	-565	83599	2793.89	-41.36	2212.82
88.000	70043	-650	88100	2973.84	-44.12	2287.44
90.000	76177	-741	92750	3161.37	-46.80	2363.13
92.000	82693	-838	97554	3355.91	-49.41	2440.90
94.000	89605	-939	102515	3557.66	-51.95	2520.87
96.000	96928	-1045	107638	3766.99	-54.42	2602.97

98.000	104678	-1157	112928	3984.26	-56.83	2687.20
100.000	112871	-1273	118388	4209.90	-59.19	2773.59
102.000	121524	-1393	124024	4444.33	-61.51	2862.18
104.000	130654	-1519	129839	4688.03	-63.80	2953.04
106.000	140282	-1649	135838	4941.52	-66.06	3046.32
108.000	150427	-1783	142026	5205.19	-68.31	3142.43
110.000	161110	-1922	148410	5479.68	-70.56	3241.58
112.000	172354	-2065	154995	5765.72	-72.81	3343.96
114.000	184181	-2213	161788	6064.12	-75.08	3449.77
116.000	196619	-2366	168796	6375.86	-77.39	3559.29
118.000	209694	-2523	176028	6702.03	-79.72	3672.84
120.000	223438	-2684	183491	7044.01	-82.11	3790.84
122.000	237882	-2851	191194	7403.07	-84.54	3913.95
124.000	253062	-3023	199150	7780.66	-87.03	4042.90

BOOSTER CUTOFF

125.532	265213	-3158	205422	8083.55	-88.97	4145.98
126.532	273314	-3247	209560	8118.20	-89.84	4130.76
127.532	281449	-3337	213684	8152.96	-90.71	4115.64

BOOSTER JETTISON

128.532	289620	-3428	217792	8187.84	-91.56	4100.61
130.000	301681	-3563	223797	8245.09	-92.63	4081.58
132.000	318250	-3750	231935	8323.68	-93.45	4055.89
134.000	334977	-3933	240019	8404.04	-89.04	4027.80
136.000	351867	-4103	248044	8485.93	-80.19	3997.25
138.000	368922	-4253	256007	8568.99	-68.81	3965.36
140.000	386144	-4377	263905	8653.07	-55.99	3932.80
142.000	403535	-4476	271738	8738.08	-42.38	3899.99
144.000	421097	-4548	279505	8824.24	-30.04	3867.28
146.000	438833	-4600	287208	8911.88	-22.94	3834.95
148.000	456745	-4644	294846	9000.79	-22.07	3802.91
150.000	474836	-4691	302419	9090.61	-25.91	3771.07
152.000	493108	-4749	309930	9181.29	-31.76	3739.44
154.000	511562	-4818	317377	9272.87	-37.35	3708.06
156.000	530200	-4897	324762	9365.41	-41.27	3676.96
158.000	549024	-4982	332085	9458.88	-43.25	3646.18
160.000	568036	-5069	339347	9553.28	-43.86	3615.72
162.000	587238	-5157	346548	9648.61	-43.91	3585.63
164.000	606631	-5245	353690	9744.90	-43.95	3555.90
166.000	626218	-5333	360773	9842.17	-44.41	3526.58
168.000	646001	-5423	367796	9940.44	-45.52	3497.65
170.000	665981	-5515	374763	10039.73	-47.08	3469.12
172.000	686160	-5611	381673	10140.07	-48.84	3441.00
174.000	706542	-5711	388527	10241.49	-50.63	3413.30
176.000	727127	-5814	395327	10344.00	-52.43	3386.03
178.000	747918	-5920	402072	10447.64	-54.26	3359.18
180.000	768918	-6031	408764	10552.42	-56.02	3332.79
182.000	790129	-6144	415403	10658.39	-57.55	3306.84
184.000	811553	-6261	421991	10765.57	-59.09	3281.36
186.000	833192	-6381	428529	10873.98	-60.64	3256.36
188.000	855049	-6504	435017	10983.66	-62.22	3231.84
190.000	877128	-6630	441456	11094.64	-63.78	3207.82
192.000	899429	-6759	447849	11206.96	-65.31	3184.31
194.000	921956	-6891	454194	11320.65	-66.85	3161.32
196.000	944712	-7026	460494	11435.75	-68.42	3138.86

198,000	967700	-7165	466750	11552.29	-70.01	3116.95
200,000	990923	-7306	472963	11670.32	-71.61	3095.60
202,000	1014382	-7451	479133	11789.87	-73.24	3074.83
204,000	1038083	-7599	485262	11910.99	-74.90	3054.64
206,000	1062027	-7751	491352	12033.72	-76.57	3035.06
208,000	1086219	-7905	497403	12158.11	-78.27	3016.11
210,000	1110661	-8064	503417	12284.21	-79.98	2997.79
212,000	1135357	-8225	509394	12412.06	-81.72	2980.12
214,000	1160311	-8391	515338	12541.72	-83.49	2963.13
216,000	1185525	-8559	521248	12673.24	-85.27	2946.84
218,000	1211005	-8732	527125	12806.69	-87.06	2931.25
220,000	1236753	-8908	532973	12942.11	-88.82	2916.41
222,000	1262774	-9087	538791	13079.57	-90.61	2902.31
224,000	1289073	-9270	544583	13219.15	-92.42	2889.00
226,000	1315652	-9457	550348	13360.89	-94.22	2876.50
228,000	1342518	-9647	556089	13504.89	-96.00	2864.82
230,000	1369673	-9841	561808	13651.21	-97.81	2854.00
232,000	1397124	-10038	567506	13799.92	-99.63	2844.06
234,000	1424875	-10239	573184	13951.13	-101.47	2835.04
236,000	1452930	-10444	578847	14104.91	-103.33	2826.96
238,000	1481296	-10653	584493	14261.35	-105.20	2819.86
240,000	1509977	-10865	590127	14420.55	-107.09	2813.78
242,000	1538980	-11081	595749	14582.61	-109.00	2808.74
244,000	1568310	-11301	601362	14747.65	-110.92	2804.79
246,000	1597973	-11525	606969	14915.77	-112.86	2801.96
248,000	1627975	-11752	612571	15087.09	-114.82	2800.31
250,000	1658323	-11984	618171	15261.75	-116.79	2799.87
251,000	1673629	-12101	620971	15350.37	-117.79	2800.12
252,000	1689024	-12220	623771	15439.88	-118.79	2800.70
253,000	1704509	-12339	626572	15530.29	-119.79	2801.60
254,000	1720085	-12459	629374	15621.62	-120.79	2802.84
255,000	1735753	-12580	632178	15713.89	-121.80	2804.42
256,000	1751513	-12703	634983	15807.12	-122.82	2806.35
257,000	1767367	-12826	637791	15901.33	-123.84	2808.64
258,000	1783316	-12950	640601	15996.55	-124.86	2811.29
259,000	1799361	-13076	643413	16092.79	-125.89	2814.32
260,000	1815502	-13202	646230	16190.08	-126.93	2817.72
261,000	1831741	-13330	649049	16288.43	-127.96	2821.52
262,000	1848079	-13458	651873	16387.89	-129.01	2825.71
263,000	1864517	-13588	654701	16488.46	-130.06	2830.31
264,000	1881057	-13718	657534	16590.18	-131.11	2835.32
265,000	1897698	-13850	660372	16693.07	-132.17	2840.76
266,000	1914443	-13983	663215	16797.16	-133.23	2846.63
267,000	1931293	-14116	666065	16902.47	-134.30	2852.95
268,000	1948249	-14251	668921	17009.05	-135.37	2859.73
269,000	1965311	-14387	671785	17116.91	-136.45	2866.97
270,000	1982483	-14524	674655	17226.10	-137.53	2874.69
271,000	1999764	-14632	677534	17336.64	-138.62	2882.90
272,000	2017156	-14801	680421	17448.56	-139.71	2891.61
273,000	2034662	-14942	683317	17561.91	-140.81	2900.84
274,000	2052281	-15083	686223	17676.72	-141.91	2910.60
275,000	2070015	-15225	689139	17793.03	-143.02	2920.90
276,000	2087867	-15369	692065	17910.88	-144.13	2931.76
277,000	2105838	-15514	695002	18030.31	-145.25	2943.19
278,000	2123928	-15660	697952	18151.36	-146.37	2955.20
279,000	2142141	-15806	700913	18274.07	-147.50	2967.82
280,000	2160477	-15954	703888	18398.51	-148.63	2981.06
281,000	2178938	-16104	706876	18524.70	-149.76	2994.94

282,000	2197527	-16254	709877	18652.71	-150.90	3009.48
283,000	2216245	-16405	712895	18782.55	-152.04	3024.69
284,000	2235093	-16558	715927	18914.39	-153.18	3040.60
285,000	2254074	-16712	718976	19048.16	-154.32	3057.22
286,000	2273190	-16867	722042	19183.98	-155.47	3074.58
287,000	2292442	-17023	725125	19321.91	-156.62	3092.70
288,000	2311834	-17180	728228	19462.00	-157.76	3111.61
289,000	2331367	-17338	731349	19604.33	-158.91	3131.33
290,000	2351044	-17498	734490	19748.98	-160.05	3151.89
291,000	2370866	-17658	737653	19896.01	-161.19	3173.31
292,000	2390836	-17820	740837	20045.51	-162.33	3195.62
293,000	2410958	-17983	744045	20197.56	-163.46	3218.86
294,000	2431232	-18147	747275	20352.25	-164.59	3243.05
295,000	2451663	-18312	750531	20509.67	-165.71	3268.23
296,000	2472253	-18479	753812	20669.93	-166.82	3294.44
297,000	2493004	-18646	757120	20833.11	-167.92	3321.71
298,000	2513920	-18814	760456	20999.34	-169.01	3350.08
299,000	2535003	-18984	763821	21148.72	-170.08	3379.59
300,000	2556258	-19154	767216	21340.81	-171.19	3410.09
301,000	2577686	-19326	770641	21516.10	-172.37	3441.74
302,000	2599291	-19499	774099	21694.90	-173.54	3474.67
303,000	2621077	-19673	777591	21877.36	-174.73	3508.93

SUSTAINER CUTOFF

303,395	2629728	-19742	778979	21950.42	-175.21	3522.83
304,000	2643013	-19849	781105	21950.34	-176.31	3504.18
308,000	2730813	-20569	794876	21949.52	-183.58	3381.12
312,000	2818609	-21318	808155	21948.25	-190.84	3258.38
316,000	2906398	-22095	820944	21946.53	-198.11	3135.97

VERNIER CUTOFF

319,323	2979331	-22764	831195	21944.76	-204.14	3034.51
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1000'
Here

FREE-FALL PARAMETERS

TIME (SEC)	RXD (FT)	RYD (FT)	RZD (FT)	VXD (FT/SEC)	VYD (FT/SEC)	VZD (FT/SEC)
319.323	2979331	-22764	831196	21944.76	-204.14	3034.51
369.500	4075300	-35252	944178	21727.57	-293.32	1477.07
819.500	12968893	-326592	-1215312	17047.18	-947.99	-10522.13
876.201	13910447	-381957	-1848666	16153.36	-1003.63	-11810.12
1269.500	18793204	-819525	-8069294	8128.22	-1141.73	-19429.85
RE-ENTRY						
1541.538	20002864	-1104531	-13891680	426.52	-896.53	-23110.59
1551.538	20005512	-1113417	-14123284	102.57	-880.31	-23206.38
1561.538	20004906	-1122124	-14355485	-223.85	-859.37	-23187.41
1571.788	20001001	-1130594	-14586857	-511.30	-752.41	-20827.73
1581.788	19996271	-1135751	-14731690	-369.58	-263.24	-7614.63
1591.538	19993201	-1137149	-14774078	-289.58	-68.57	-2322.75
1601.413	19990279	-1137513	-14788852	-321.55	-15.79	-985.06
1610.413	19986714	-1137571	-14796685	-467.77	1.86	-779.10
IMPACT						
1616.261	19983743	-1137534	-14800963	-545.32	10.64	-686.58

POWERED FLIGHT PARAMETERS

TIME (SEC)	RANGE (IN MI)	ALT (FT)	VELOCITY (FT/SEC)	ANGLE (DEGREES)	FLT PATH		AC XI (FPS2)	WEIGHT (LBS)
					THRUST (LBS)	AC XI (FPS2)		
0.00	0.00	210	0	0	391962	47.0	268242	
2.00	0.00	240	30.3	90.0	391965	47.5	265060	
4.00	0.00	332	61.8	90.0	392183	48.1	261879	
6.00	0.00	488	94.4	90.0	392616	48.8	258698	
8.00	0.00	710	128.4	90.0	393271	49.4	255517	
10.00	0.00	1002	163.7	90.0	394149	50.1	252335	
12.00	0.00	1366	200.5	90.0	395251	50.8	249152	
14.00	0.00	1805	238.7	89.9	396577	51.6	245968	
16.00	0.0	2322	278.6	89.8	398127	52.4	242783	
18.00	0.00	2920	320.0	89.1	399897	53.3	239595	
20.00	0.00	3603	363.1	87.8	401828	54.1	236406	
22.00	0.01	4372	408.0	86.1	404007	55.1	233215	
24.00	0.02	5232	454.8	84.1	406393	56.1	230021	
26.00	0.04	6183	503.9	82.0	408965	57.1	226824	
28.00	0.07	7228	555.3	79.8	411716	58.1	223624	
30.00	0.11	8370	609.4	77.6	414324	59.2	220422	
32.00	0.16	9610	666.1	75.5	416709	60.2	217219	
34.00	0.22	10950	725.7	73.4	419138	61.3	214018	
36.00	0.29	12393	788.0	71.5	421684	62.3	210818	
38.00	0.38	13939	853.0	69.5	424247	63.2	207619	
40.00	0.49	15589	920.1	67.6	426757	63.7	204422	
42.00	0.61	17342	988.7	65.8	429093	63.7	201228	
44.00	0.76	19156	1057.9	64.1	431462	63.7	198037	
46.00	0.92	21149	1128.5	62.5	433934	64.3	194848	
48.00	1.10	23199	1201.9	60.8	436443	65.5	191662	
50.00	1.19	25348	1278.9	59.3	439001	67.0	188476	
52.00	1.45	27597	1360.1	57.8	441497	68.7	185291	
54.00	1.68	29950	1445.7	56.3	443866	70.5	182106	
56.00	1.97	32407	1535.7	54.8	446181	72.3	178922	
58.00	2.30	34972	1630.5	53.4	448394	74.2	175738	
60.00	2.66	37647	1730.0	52.1	450499	76.3	172554	
62.00	3.03	40433	1834.8	50.8	452450	78.5	169370	
64.00	3.41	43335	1945.0	49.5	454212	80.8	166186	
66.00	3.85	46353	2060.9	48.3	455881	83.2	163001	
68.00	4.32	49491	2182.6	47.2	457369	85.7	159816	
70.00	4.82	52754	2310.2	46.0	458762	88.3	156630	
72.00	5.38	56144	2444.0	45.0	459969	91.0	153443	
74.00	6.00	59665	2584.1	43.9	461087	93.7	150256	
76.00	6.61	63318	2730.6	43.0	462071	96.6	147068	
78.00	7.30	67108	2883.8	42.0	462964	99.5	143878	
80.00	8.03	71038	3043.6	41.1	463731	102.5	140688	
82.00	8.80	75111	3210.2	40.2	464402	105.5	137497	
84.00	9.64	79331	3383.7	39.4	464981	108.6	134304	
86.00	10.53	83698	3564.3	38.6	465499	111.8	131111	
88.00	11.45	88217	3752.1	37.8	465959	115.1	127917	
90.00	12.47	92888	3947.3	37.0	466362	118.5	124722	
92.00	13.55	97717	4150.0	36.3	466688	122.0	121525	
94.00	14.67	102706	4360.6	35.6	466985	125.7	118328	
96.00	15.86	107862	4579.1	34.9	467264	129.5	115130	
98.00	17.13	113189	4806.1	34.3	467527	133.4	111930	
100.00	18.47	118692	5041.8	33.7	467778	137.6	108730	

102.00	19.88	124375	5286.6	33.1	468004	142.0	105527
104.00	21.37	130245	5541.0	32.6	468235	146.6	102323
106.00	22.93	136305	5805.4	32.0	468475	151.6	99118
108.00	24.59	142563	6080.6	31.5	468730	156.8	95910
110.00	26.33	149026	6367.1	31.0	469004	162.4	92700
112.00	28.15	155699	6665.6	30.6	469259	168.4	89488
114.00	30.07	162592	6977.1	30.1	469500	174.9	86274
116.00	32.10	169712	7302.5	29.7	469982	181.8	83057
118.00	34.22	177070	7642.9	29.3	470638	189.5	79835
120.00	36.45	184673	7999.7	28.9	471407	197.9	76609
122.00	38.79	192534	8374.5	28.5	472247	207.0	73376
124.00	41.26	200666	8768.8	28.1	473156	217.0	70136

BOOSTER CUTOFF

125.53	43.22	207086	9085.2	27.9	473911	225.4	67650
126.53	44.53	211327	9109.1	27.7	80652	38.7	67383
127.53	45.85	215557	9133.3	27.5	80681	38.8	67115

BOOSTER JETTISON

128.53	47.17	219775	9157.7	27.4	80713	39.0	66848
130.00	49.12	225948	9200.5	27.2	80259	43.7	59317
132.00	51.80	234327	9259.7	26.8	80320	44.1	58782
134.00	54.50	242668	9319.8	26.5	80379	44.5	58246
136.00	57.23	250967	9380.6	26.2	80479	44.9	57710
138.00	59.98	259218	9442.3	25.8	80615	45.4	57175
140.00	62.75	267422	9505.0	25.5	80734	45.9	56639
142.00	65.55	275577	9569.0	25.1	80814	46.3	56104
144.00	68.38	283684	9634.5	24.8	80870	46.8	55568
146.00	71.23	291743	9702.0	24.5	80917	47.3	55033
148.00	74.12	299757	9771.2	24.1	80956	47.8	54497
150.00	77.02	307726	9841.8	23.8	80989	48.2	53961
152.00	79.96	315650	9913.7	23.5	80993	48.7	53425
154.00	82.92	323532	9986.9	23.2	80984	49.2	52889
156.00	85.91	331371	10061.4	22.9	80977	49.7	52353
158.00	88.93	339169	10137.4	22.6	80970	50.2	51817
160.00	91.97	346927	10214.7	22.3	80963	50.8	51281
162.00	95.05	354646	10293.4	22.0	80957	51.3	50745
164.00	98.15	362329	10373.5	21.7	80952	51.8	50208
166.00	101.29	369974	10455.0	21.4	80946	52.4	49672
168.00	104.45	377586	10537.9	21.1	80941	53.0	49136
170.00	107.64	385164	10622.3	20.9	80937	53.5	48600
172.00	110.87	392710	10708.1	20.6	80932	54.1	48064
174.00	114.12	400225	10795.4	20.3	80927	54.7	47528
176.00	117.41	407712	10884.2	20.1	80923	55.4	46992
178.00	120.72	415171	10974.5	19.8	80919	56.0	46456
180.00	124.07	422604	11066.4	19.6	80914	56.6	45920
182.00	127.45	430013	11159.7	19.4	80910	57.3	45384
184.00	130.86	437399	11254.7	19.1	80906	58.0	44848
186.00	134.30	444764	11351.3	18.9	80902	58.7	44312
188.00	137.78	452109	11449.4	18.7	80898	59.4	43776
190.00	141.29	459437	11549.3	18.5	80894	60.1	43240
192.00	144.84	466749	11650.8	18.3	80890	60.9	42704
194.00	148.42	474046	11754.0	18.1	80886	61.7	42168
196.00	152.03	481331	11858.9	17.9	80883	62.5	41632
198.00	155.68	488606	11965.6	17.7	80879	63.3	41096
200.00	159.36	495874	12074.1	17.5	80875	64.1	40561

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202.00	163.08	503134	12184.5	17.3	80872	65.0	40025
204.00	166.84	510390	12296.7	17.2	80868	65.8	39489
206.00	170.63	517644	12410.8	17.0	80865	66.7	38953
208.00	174.47	524898	12526.9	16.8	80862	67.7	38418
210.00	178.33	532154	12645.0	16.7	80858	68.6	37882
212.00	182.24	539415	12765.1	16.5	80855	69.6	37346
214.00	186.19	546682	12887.3	16.4	80851	70.6	36811
216.00	190.17	553959	13011.6	16.3	80848	71.6	36275
218.00	194.20	561247	13138.2	16.1	80845	72.7	35739
220.00	198.27	568550	13266.9	16.0	80841	73.8	35204
222.00	202.37	575870	13398.0	15.9	80838	75.0	34668
224.00	206.52	583210	13531.5	15.8	80835	76.1	34133
226.00	210.71	590572	13667.4	15.7	80832	77.3	33597
228.00	214.95	597960	13805.7	15.6	80829	78.6	33062
230.00	219.22	605376	13946.7	15.5	80826	79.9	32526
232.00	223.55	612824	14090.3	15.4	80823	81.2	31991
234.00	227.91	620307	14236.6	15.3	80820	82.6	31456
236.00	232.33	627828	14385.8	15.2	80817	84.0	30920
238.00	236.79	635390	14537.8	15.1	80815	85.5	30385
240.00	241.29	642997	14692.9	15.1	80812	87.0	29849
242.00	245.85	651652	14851.0	15.0	80809	88.6	29314
244.00	250.45	658361	15012.4	14.9	80807	90.3	28779
246.00	255.11	666126	15177.1	14.9	80804	92.0	28243
248.00	259.81	673951	15345.2	14.8	80801	93.7	27708
250.00	264.57	681841	15516.9	14.8	80799	95.6	27173
251.00	266.96	685811	15604.1	14.8	80798	96.5	26905
252.00	269.37	689800	15692.3	14.8	80797	97.5	26638
253.00	271.80	693806	15781.4	14.8	80795	98.5	26370
254.00	274.24	697832	15871.5	14.7	80794	99.5	26102
255.00	276.69	701877	15962.6	14.7	80793	100.5	25835
256.00	279.15	705943	16054.8	14.7	80792	101.6	25567
257.00	281.63	710029	16147.9	14.7	80791	102.6	25300
258.00	284.13	714137	16242.2	14.7	80790	103.7	25032
259.00	286.63	718267	16337.5	14.7	80789	104.9	24764
260.00	289.15	722419	16433.9	14.7	80788	106.0	24497
261.00	291.69	726595	16531.5	14.7	80787	107.2	24229
262.00	294.24	730796	16630.2	14.7	80786	108.4	23962
263.00	296.81	735021	16730.1	14.7	80785	109.6	23694
264.00	299.39	739271	16831.2	14.7	80784	110.8	23426
265.00	301.95	743548	16933.6	14.7	80783	112.1	23159
266.00	304.59	747852	17037.2	14.7	80782	113.4	22891
267.00	307.22	752184	17142.1	14.7	80781	114.8	22624
268.00	309.86	756545	17248.3	14.7	80780	116.1	22356
269.00	312.52	760935	17355.9	14.7	80779	117.6	22089
270.00	315.19	765354	17464.9	14.7	80778	119.0	21821
271.00	317.88	769806	17575.2	14.7	80777	120.5	21553
272.00	320.59	774289	17687.1	14.7	80776	122.0	21286
273.00	323.31	778805	17800.4	14.8	80775	123.5	21018
274.00	326.05	783355	17915.3	14.8	80775	125.1	20751
275.00	328.81	787940	18031.8	14.8	80774	126.8	20483
276.00	331.58	792560	18149.8	14.8	80773	128.4	20216
277.00	334.37	797217	18269.5	14.8	80772	130.2	19948
278.00	337.18	801911	18390.9	14.9	80771	131.9	19681
279.00	340.01	806645	18514.1	14.9	80770	133.7	19413
280.00	342.85	811417	18639.0	14.9	80769	135.6	19146
281.00	345.71	816231	18765.8	14.9	80769	137.5	18878
282.00	348.59	821087	18894.5	15.0	80768	139.5	18611
283.00	351.50	825986	19025.2	15.0	80767	141.5	18343

284.00	354.41	830929	19157.8	15.0	80766	143.6	18076
285.00	357.35	835918	19292.6	15.1	80765	145.8	17808
286.00	360.31	840953	19429.4	15.1	80765	148.0	17541
287.00	363.29	846037	19568.5	15.1	80764	150.3	17273
288.00	366.29	851170	19709.8	15.2	80763	152.7	17005
289.00	369.30	856354	19853.5	15.2	80762	155.1	16738
290.00	372.34	861590	19999.6	15.3	80761	157.6	16470
291.00	375.40	866879	20148.1	15.3	80759	160.2	16203
292.00	378.48	872224	20299.3	15.4	80758	162.9	15936
293.00	381.59	877626	20453.1	15.4	80757	165.7	15668
294.00	384.71	883085	20609.7	15.5	80755	168.5	15401
295.00	387.86	888605	20769.1	15.5	80753	171.5	15133
296.00	391.03	894187	20931.5	15.6	80751	174.6	14866
297.00	394.23	899832	21096.9	15.6	80749	177.8	14598
298.00	397.44	905542	21265.6	15.7	80747	181.1	14331
299.00	400.69	911320	21437.5	15.7	80744	184.5	14063
300.00	403.95	917167	21612.2	15.8	80394	187.3	13796
301.00	407.24	923084	21790.3	15.9	80390	191.0	13529
302.00	410.56	929075	21972.1	15.9	80385	194.8	13263
303.00	413.90	935140	22157.7	16.0	80380	198.8	12996

SUSTAINER CUTOFF

303.39	415.23	937556	22232.0	16.0	80377	200.4	12890
304.00	417.26	941267	22229.0	16.0	1270	3.2	12886
308.00	430.71	965706	22209.2	15.9	1270	3.2	12854
312.00	444.14	989950	22189.6	15.8	1270	3.2	12822
316.00	457.55	1020127	22170.3	15.8	1270	3.2	12791

VERNIER CUTOFF

319.32	468.67	1034048	22154.5	15.7	1270	3.2	12765
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REFERENCE TRAJECTORY

PREMATURE CUTOFF
PARAMETERS

TIME (SEC.)	GEOD. LAT. (DEG.)	LONG. (DEG.)	FREE-FALL TIME (SEC.)	DOWN-RANGE DISTANCE (N.MI.)	CROSS-RANGE DISTANCE (N.MI.)
2.00	34.7960	120.5890	5.2	.0	.0
4.00	34.7960	120.5890	6.9	.0	.0
8.00	34.7960	120.5890	11.7	.0	.0
12.00	34.7960	120.5890	17.4	.0	.0
16.00	34.7960	120.5891	23.5	.0	.0
20.00	34.7960	120.5905	30.1	.0	.0
24.00	34.7959	120.5952	37.0	.0	.0
28.00	34.7957	120.6049	44.2	.7	.0
32.00	34.7955	120.6209	51.7	1.6	.0
36.00	34.7954	120.6446	59.5	2.8	-.0
40.00	34.7954	120.6775	67.4	4.4	-.0
44.00	34.7954	120.7199	75.2	6.5	-.1
48.00	34.7944	120.7727	82.9	9.1	-.0
52.00	34.7936	120.8389	90.7	12.3	-.0
56.00	34.7932	120.9213	98.8	16.4	-.1
72.00	34.7952	121.4695	134.3	43.5	-.8
76.00	34.7955	121.6796	144.2	53.9	-1.0
80.00	34.7953	121.9273	154.6	66.1	-1.4
84.00	34.7944	122.2178	165.4	80.5	-1.7
88.00	34.7923	122.5564	176.7	97.2	-2.1
92.00	34.7885	122.9494	188.6	116.6	-2.6
96.00	34.7823	123.4050	201.2	139.2	-3.1
100.00	34.7730	123.9327	214.6	165.2	-3.8
104.00	34.7594	124.5447	229.1	195.5	-4.5
108.00	34.7398	125.2564	244.7	230.7	-5.3
112.00	34.7118	126.0882	261.8	271.9	-6.3
116.00	34.6723	127.0670	280.8	320.4	-7.5
120.00	34.6159	128.2294	302.0	378.0	-9.0
124.00	34.5346	129.6285	326.3	447.5	-10.9
BOOSTER CUTOFF					
125.53	34.4943	130.2416	336.6	478.0	-11.8
132.00	34.4587	130.7402	339.6	502.8	-12.4
136.00	34.4195	131.0648	341.4	519.1	-12.0
140.00	34.3689	131.3889	342.9	535.4	-10.9
144.00	34.3146	131.7203	344.4	552.1	-9.7
148.00	34.2744	132.0670	346.0	569.5	-9.4
152.00	34.2482	132.4277	347.7	587.5	-10.2
156.00	34.2199	132.8005	349.6	606.1	-11.0
160.00	34.1829	133.1854	351.7	625.4	-11.4
164.00	34.1409	133.5838	353.9	645.4	-11.7
168.00	34.0974	133.9975	356.3	666.2	-12.1
172.00	34.0525	134.4276	359.0	687.8	-12.6
176.00	34.0045	134.8751	361.8	710.3	-13.2

180.00	33.9528	135.3413	365.0	733.7	-13.8
184.00	33.8965	135.8277	368.4	758.2	-14.4
188.00	33.8358	136.3359	372.1	783.9	-15.0
192.00	33.7700	136.8678	376.1	810.8	-15.7
196.00	33.6987	137.4254	380.5	839.0	-16.4
200.00	33.6212	138.0112	385.3	868.7	-17.2
204.00	33.5369	138.6276	390.5	900.0	-18.0
208.00	33.4448	139.2775	396.2	933.1	-18.9
212.00	33.3440	139.9645	402.3	968.1	-19.9
216.00	33.2333	140.6921	409.1	1005.3	-21.0
220.00	33.1112	141.4646	416.5	1044.9	-22.1
224.00	32.9761	142.2871	424.6	1087.1	-23.4
228.00	32.8260	143.1652	433.5	1132.4	-24.8
232.00	32.6586	144.1054	443.3	1181.0	-26.3
236.00	32.4713	145.1141	454.1	1233.4	-28.0
240.00	32.2603	146.2027	466.1	1290.1	-29.8
244.00	32.0214	147.3807	479.4	1351.8	-31.9
248.00	31.7495	148.6604	494.2	1419.1	-34.3
252.00	31.4379	150.0568	510.8	1493.1	-37.0
256.00	31.0785	151.5878	529.4	1574.7	-40.1
260.00	30.6607	153.2749	550.5	1665.3	-43.6
264.00	30.1709	155.1448	574.5	1766.6	-47.7
268.00	29.5913	157.2300	602.0	1880.7	-52.6
272.00	28.8984	159.5714	633.8	2010.3	-58.3
276.00	28.0605	162.2201	670.8	2159.0	-65.2
280.00	27.0343	165.2419	714.4	2331.4	-73.5
282.00	26.4327	166.9182	739.2	2428.3	-78.3
284.00	25.7597	168.7215	766.4	2533.6	-83.7
286.00	25.0039	170.6667	796.3	2648.5	-89.7
288.00	24.1516	172.7709	829.4	2774.2	-96.5
290.00	23.1862	175.0543	866.0	2912.5	-104.1
292.00	22.0877	177.5404	906.9	3065.2	-112.6
294.00	20.8319	-179.7430	952.7	3234.5	-122.3
296.00	19.3894	-176.7628	1004.4	3423.4	-133.3
298.00	17.7244	-173.4792	1063.1	3635.1	-145.8
300.00	15.7970	-169.8496	1129.9	3873.3	-160.0
302.00	13.5595	-165.8204	1206.7	4142.7	-176.1

SUSTAINER CUTOFF

303.39	11.7802	-162.7297	1267.3	4352.5	-188.5
304.00	11.7673	-162.7076	1267.1	4354.0	-188.5
306.00	11.7246	-162.6346	1266.6	4359.0	-188.8
308.00	11.6819	-162.5617	1266.1	4363.9	-189.1
312.00	11.5963	-162.4156	1265.0	4373.9	-189.7
316.00	11.5105	-162.2695	1264.0	4383.9	-190.3

VERNIER CUTOFF

319.32	11.4390	-162.1479	1263.1	4392.3	-190.7
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REPORT AE62-0110

CONVAIR ASTRONAUTICS

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TABLE IV

GENERAL DYNAMICS ASTRONAUTICS

FAST-DISPERSION TRAJECTORY
FOR RANGE SAFETY

MISSILE	24E
LAUNCH AZIMUTH	269.1736 DEG. E OF N
TARGET	GEOD. LAT. 11.44647 DEG. N LONG. 162.26619 DEG. E RANGE 4386 KM
NOSE CONE IMPACT	GEOD. LAT. 11.4490 DEG. N LONG. 164.2713 DEG. E RANGE 4386 KM
NOSE CONE	AVCO MARK IV MOD. 5
GUIDANCE	ARMA LOT IV
SEA LEVEL L_{SP}	BOOSTER 248.00 SEC. SUSTAINER 211.88 SEC. VEHICLE 207.70 SEC.
PITCH PROGRAM	STANDARD, D-10G PITCH PROGRAM ATTENUATED BY A FACTOR OF 0.9377
STAGING CRITERION FOR BOOSTER	ARMA Z DOT = 6647.87 FPS
LAUNCH WEIGHT (LIFT OFF)	251,442 LB

This document contains information affecting the national defense of the United States within the meaning of the Espionage Laws, Title 18, USC, Sections 793 and 794. The transmission or the revelation of its contents in any manner to an unauthorized person is prohibited by law.

FORM NO. A-702-9

~~SECRET~~

FAST MISSILE DISPERSION

POWERED FLIGHT PARAMETERS

TIME (SEC)	RXD (FT)	RYD (FT)	RZD (FT)	VXD (FT/SEC)	VYD (FT/SEC)	VZD (FT/SEC)
0.000	0	1	210	.00	-.00	.00
2.000	-0	1	243	-.01	.09	33.30
4.000	0	1	344	.01	.17	67.86
6.000	0	1	515	.03	.26	103.76
8.000	0	2	760	.06	.35	141.06
10.000	0	3	1080	.11	.45	179.86
12.000	1	4	1480	.16	.55	220.22
14.000	1	5	1962	.23	.65	262.23
16.000	2	7	2530	.82	.76	305.98
18.000	7	8	3187	5.36	.89	351.46
20.000	26	10	3937	14.54	1.04	398.56
22.000	69	12	4783	28.56	1.19	447.19
24.000	144	15	5727	47.57	1.36	497.23
26.000	262	18	6772	71.74	1.52	548.56
28.000	434	21	7922	101.04	1.66	601.10
30.000	669	24	9178	134.43	1.74	654.92
32.000	975	28	10542	171.81	1.72	709.91
34.000	1359	31	12018	213.22	1.48	765.93
36.000	1830	34	13607	258.64	.87	822.67
38.000	2396	34	15309	307.94	-.37	879.46
40.000	3064	32	17124	360.60	-1.98	935.32
42.000	3840	27	19049	416.00	-1.90	989.89
44.000	4730	25	21083	474.52	-.43	1043.94
46.000	5741	26	23225	536.87	.91	1098.64
48.000	6881	28	25478	603.62	1.63	1154.61
50.000	8159	32	27844	675.11	1.63	1212.07
52.000	9585	34	30327	751.57	.89	1271.00
54.000	11168	35	32929	833.25	-.54	1331.28
56.000	12921	32	35653	920.08	-2.55	1393.12
58.000	14852	24	38503	1012.09	-4.98	1456.74
60.000	16973	12	41482	1109.73	-7.65	1522.25
62.000	19295	-6	44593	1213.35	-10.45	1589.53
64.000	21831	-30	47841	1323.32	-13.34	1658.50
66.000	24592	-60	51228	1439.43	-16.25	1729.51
68.000	27592	-95	54761	1561.49	-19.18	1802.94
70.000	30843	-137	58442	1689.90	-22.09	1878.63
72.000	34356	-184	62277	1825.00	-24.98	1956.45
74.000	38147	-236	66269	1967.08	-27.86	2036.23
76.000	42229	-295	70423	2116.10	-30.72	2118.20
78.000	46616	-359	74743	2271.99	-33.56	2202.53
80.000	51322	-429	79234	2435.06	-36.36	2289.07
82.000	56362	-505	83901	2605.60	-39.11	2377.71
84.000	61750	-586	88747	2783.89	-41.76	2468.34
86.000	67502	-672	93775	2970.21	-44.32	2560.88
88.000	73636	-763	98992	3164.87	-46.78	2655.27
90.000	80168	-859	104398	3368.08	-49.15	2751.62
92.000	87114	-959	110000	3579.36	-51.45	2851.01
94.000	94491	-1065	115804	3799.02	-53.69	2953.63
96.000	102316	-1174	121816	4027.59	-55.87	3059.52

98.000	110607	-1288	128044	4265.60	-58.00	3168.78
100.000	119385	-1406	134495	4513.66	-60.10	3281.54
102.000	128669	-1528	141173	4772.43	-62.17	3398.00
104.000	138482	-1655	148088	5042.65	-64.22	3518.37
106.000	148848	-1785	155249	5325.11	-66.26	3642.94
108.000	159791	-1920	162664	5620.56	-68.33	3772.27
110.000	171339	-2059	170342	5929.99	-70.42	3906.81
112.000	183521	-2201	178295	6254.57	-72.54	4047.00
114.000	196369	-2349	186534	6595.64	-74.71	4193.32
116.000	209916	-2500	195072	6954.77	-76.91	4346.34
118.000	224201	-2656	203924	7333.78	-79.14	4506.77
120.000	239266	-2817	213105	7734.89	-81.41	4675.49
BOOSTER CUTOFF						
122.032	255418	-2985	222788	8167.40	-83.73	4856.64
123.032	263604	-3069	227639	8204.73	-84.55	4845.18
124.032	271828	-3154	232478	8242.20	-85.36	4833.84
BOOSTER JETTISON						
125.032	280088	-3240	237306	8279.81	-86.17	4822.62
126.000	288123	-3323	241970	8320.99	-86.98	4814.42
128.000	304851	-3499	251582	8406.65	-88.49	4797.87
130.000	321751	-3674	261160	8494.60	-85.28	4778.91
132.000	338831	-3836	270696	8585.40	-76.51	4755.63
134.000	356094	-3978	280181	8678.13	-64.69	4729.79
136.000	373545	-4094	289613	8772.41	-51.26	4702.55
138.000	391185	-4182	298991	8865.11	-37.03	4674.66
140.000	409018	-4242	308312	8965.22	-22.38	4646.59
142.000	427047	-4272	317577	9063.67	-7.53	4618.59
144.000	445274	-4272	326787	9163.54	6.28	4590.88
146.000	463702	-4250	335941	9265.23	14.52	4563.75
148.000	482336	-4219	345042	9368.54	15.70	4537.13
150.000	501177	-4191	354090	9473.13	11.90	4510.85
152.000	520229	-4173	363086	9578.91	6.34	4484.90
154.000	539494	-4165	372030	9685.96	1.40	4459.31
156.000	558974	-4166	380923	9794.31	-1.63	4434.12
158.000	578672	-4171	389766	9903.96	-2.80	4409.37
160.000	598590	-4176	398561	10014.91	-2.95	4385.09
162.000	618732	-4182	407307	10127.19	-2.93	4361.33
164.000	639100	-4188	416006	10240.85	-3.09	4338.10
166.000	659697	-4195	424660	10355.92	-3.86	4315.43
168.000	680525	-4204	433269	10472.43	-5.09	4293.32
170.000	701587	-4216	441833	10590.43	-6.63	4271.79
172.000	722887	-4231	450356	10709.96	-8.22	4250.83
174.000	744428	-4249	458837	10831.06	-9.82	4230.48
176.000	766212	-4270	467278	10953.77	-11.45	4210.73
178.000	788244	-4294	475681	11078.15	-12.91	4191.62
180.000	810526	-4321	484045	11204.23	-14.24	4173.16
182.000	833062	-4351	492374	11332.07	-15.52	4155.36
184.000	855856	-4383	500667	11461.73	-16.82	4138.25
186.000	878910	-4418	508927	11593.25	-18.13	4121.85
188.000	902230	-4456	517155	11726.69	-19.46	4106.18
190.000	925819	-4496	525352	11862.12	-20.81	4091.25
192.000	949680	-4539	533521	11999.59	-22.18	4077.10
194.000	973818	-4585	541661	12139.18	-23.57	4063.73
196.000	998238	-4634	549776	12280.95	-24.97	4051.19

198.000	1022943	-4685	557866	12424.97	-26.38	4039.49
200.000	1047939	-4739	565935	12571.33	-27.81	4028.66
202.000	1073230	-4796	573982	12720.09	-29.26	4018.73
204.000	1098821	-4856	582010	12871.35	-30.72	4009.72
206.000	1124717	-4919	590021	13025.19	-32.19	4001.68
208.000	1150924	-4985	598018	13181.71	-33.68	3994.64
210.000	1177446	-5054	606000	13341.01	-35.17	3938.62
212.000	1204290	-5126	613973	13503.18	-36.69	3983.66
214.000	1231461	-5200	621936	13668.33	-38.21	3979.82
216.000	1258965	-5278	629893	13836.59	-39.74	3977.11
218.000	1286809	-5359	637845	14008.07	-41.27	3975.60
220.000	1315000	-5444	645796	14182.91	-42.75	3975.32
222.000	1343543	-5530	653747	14361.24	-44.25	3976.33
224.000	1372447	-5620	661702	14543.20	-45.75	3978.67
226.000	1401718	-5713	669663	14728.96	-47.27	3982.41
228.000	1431365	-5809	677633	14918.67	-48.79	3987.60
230.000	1461396	-5909	685614	15112.52	-50.33	3994.30
232.000	1491818	-6011	693611	15310.68	-51.87	4002.58
234.000	1522642	-6116	701626	15513.36	-53.43	4012.52
236.000	1553875	-6225	709662	15720.78	-55.00	4024.19
238.000	1585528	-6336	717724	15933.17	-56.57	4037.67
240.000	1617611	-6451	725814	16150.76	-58.16	4053.06
242.000	1650135	-6569	733937	16373.83	-59.75	4070.44
244.000	1683110	-6690	742097	16602.67	-61.35	4089.93
246.000	1716549	-6814	750298	16837.57	-62.96	4111.63
248.000	1750465	-6942	758545	17078.88	-64.58	4135.66
250.000	1784869	-7073	766842	17326.96	-66.20	4162.16
251.000	1802259	-7139	771012	17453.66	-67.01	4176.38
252.000	1819777	-7207	775196	17582.20	-67.82	4191.27
253.000	1837424	-7275	779394	17712.63	-68.63	4206.85
254.000	1855203	-7344	783610	17845.02	-69.44	4223.14
255.000	1873115	-7413	787841	17979.43	-70.24	4240.16
256.000	1891162	-7484	792090	18115.90	-71.05	4257.94
257.000	1909348	-7556	796357	18254.52	-71.85	4276.50
258.000	1927672	-7628	800643	18395.35	-72.65	4295.87
259.000	1946139	-7701	804949	18538.46	-73.44	4316.06
260.000	1964750	-7775	809276	18683.92	-74.26	4337.11
261.000	1983508	-7849	813624	18831.82	-75.10	4359.05
262.000	2002414	-7925	817994	18982.24	-75.94	4381.91
263.000	2021473	-8001	822388	19135.26	-76.77	4405.71
264.000	2040686	-8079	826806	19290.98	-77.65	4430.50
265.000	2060056	-8157	831249	19449.49	-78.52	4456.30
266.000	2079586	-8236	835719	19610.89	-79.37	4483.16
267.000	2099278	-8315	840216	19775.30	-80.22	4511.11
268.000	2119137	-8396	844741	19942.82	-81.09	4540.19
269.000	2139165	-8478	849296	20113.58	-81.96	4570.46
270.000	2159365	-8560	853882	20287.34	-82.82	4601.81
271.000	2179741	-8643	858501	20464.17	-83.66	4634.29
272.000	2200295	-8727	863151	20644.62	-84.54	4668.09
273.000	2221031	-8812	867837	20828.84	-85.47	4703.27
274.000	2241954	-8898	872558	21016.97	-86.38	4739.87
275.000	2263066	-8985	877317	21209.20	-87.26	4777.95

SUSTAINER CUTOFF

276.145	2287474	-9086	882813	21434.49	-88.22	4823.46
280.000	2370114	-9439	901181	21436.91	-95.12	4705.75
284.000	2455866	-9834	919761	21439.00	-102.27	4583.96

286,000 2541626 -10257 937853 21440.66 -109.43 4462.53

289,338 2570319 -10405 943798 21441.12 -111.82 4421.98

VERNIER CUTOFF

POWERED FLIGHT PARAMETERS

TIME (SEC)	RANGE (N MI)	ALT (FT)	VELOCITY (FT/SEC)	ANGLE (DEGREES)	THRUST (LBS)	AC XI (FPS2)	WEIGHT (LBS)
0.00	0.00	210	0.0	0.0	398535	48.4	264442
2.00	0.00	243	33.3	90.0	398567	49.1	261142
4.00	0.00	344	67.9	90.0	398836	49.7	257842
6.00	0.00	515	103.8	90.0	399346	50.4	254542
8.00	0.00	760	141.1	90.0	400098	51.1	251242
10.00	0.00	1080	179.9	90.0	401094	51.9	247941
12.00	0.00	1480	220.2	89.9	402336	52.7	244639
14.00	0.00	1962	262.2	89.9	403824	53.5	241335
16.00	0.00	2530	306.0	89.8	405558	54.4	238030
18.00	0.00	3187	351.5	89.1	407532	55.3	234722
20.00	0.00	3937	393.8	87.9	409689	56.3	231413
22.00	.01	4783	448.1	86.3	412107	57.3	228100
24.00	.02	5727	499.5	84.5	414742	58.4	224784
26.00	.04	6772	553.2	82.6	417587	59.5	221466
28.00	.07	7922	609.5	80.5	420545	60.7	218144
30.00	.11	9178	668.6	78.4	423067	61.8	214820
32.00	.16	10542	730.4	76.4	425620	62.9	211493
34.00	.22	12018	795.1	74.5	428302	64.0	208177
36.00	.30	13607	862.4	72.6	431007	64.9	204857
38.00	.39	15309	931.8	70.7	433655	65.4	201539
40.00	.50	17124	1002.4	68.9	436155	65.4	198224
42.00	.63	19050	1073.8	67.2	438693	65.5	194913
44.00	.78	21084	1146.7	65.6	441363	66.4	191604
46.00	.94	23226	1222.8	64.0	444065	67.8	188297
48.00	1.13	25480	1302.9	62.4	446805	69.5	184990
50.00	1.19	27846	1387.4	60.9	449486	71.4	181684
52.00	1.45	30330	1476.6	59.4	452016	73.3	178379
54.00	1.78	32933	1570.5	58.0	454487	75.4	175073
56.00	2.06	35658	1669.5	56.6	456843	77.5	171768
58.00	2.38	38509	1773.8	55.3	459076	79.8	168462
60.00	2.72	41489	1883.8	54.0	461169	82.3	165156
62.00	3.14	44602	1999.7	52.7	463022	84.9	161850
64.00	3.56	47853	2121.8	51.5	464770	87.6	158543
66.00	3.98	51243	2250.2	50.3	466316	90.4	155235
68.00	4.48	54779	2385.2	49.2	467750	93.3	151926
70.00	5.04	58465	2527.0	48.1	468995	96.3	148616
72.00	5.60	62305	2675.6	47.1	470116	99.4	145304
74.00	6.23	66304	2831.3	46.1	471093	102.6	141992
76.00	6.93	70466	2994.3	45.1	471958	105.8	138678
78.00	7.63	74795	3164.5	44.2	472738	109.2	135363
80.00	8.39	79298	3342.3	43.4	473412	112.6	132047
82.00	9.21	83977	3527.6	42.5	473987	116.1	128729
84.00	10.10	88838	3720.8	41.7	474489	119.7	125410
86.00	11.05	93884	3922.0	40.9	474940	123.4	122089
88.00	12.05	99121	4131.5	40.2	475332	127.3	118767
90.00	13.13	104551	4349.5	39.5	475678	131.3	115444
92.00	14.25	110181	4576.3	38.8	475967	135.5	112119
94.00	15.45	116017	4812.4	38.1	476242	139.9	108792
96.00	16.73	122066	5058.2	37.5	476512	144.6	105464
98.00	18.09	128335	5314.1	36.9	476784	149.6	102133
100.00	19.52	134833	5580.8	36.3	477079	154.8	98801

102.00	21.03	141566	5850.9	35.8	477414	160.4	95466
104.00	22.63	148544	6149.1	35.3	477774	166.5	92128
106.00	24.31	155775	6452.3	34.8	478165	172.9	88788
108.00	26.09	163269	6769.4	34.3	478600	179.9	85444
110.00	27.97	171038	7101.6	33.8	479087	187.5	82097
112.00	29.95	179093	7450.0	33.4	479587	195.8	78746
114.00	32.03	187447	7816.1	33.0	480159	204.8	75391
116.00	34.22	196116	8201.5	32.6	480804	214.7	72031
118.00	36.54	205113	8602.2	32.2	481766	225.7	68665
120.00	38.98	214459	9038.5	31.8	482885	237.9	65290

BOOSTER CUTOFF

122.03	41.59	224330	9502.7	31.4	484141	251.8	61852
123.03	42.91	229281	9528.9	31.3	81488	42.7	61576
124.03	44.24	234224	9555.5	31.1	81528	42.9	61301

BOOSTER JETTISON

125.03	45.58	239159	9582.3	31.0	81567	43.1	61025
126.00	46.87	243931	9613.8	30.8	81106	48.7	53617
128.00	49.57	253776	9679.8	30.5	81174	49.3	53066
130.00	52.30	263602	9747.0	30.2	81237	49.8	52515
132.00	55.05	273402	9814.8	29.9	81305	50.3	51964
134.00	57.83	283169	9883.6	29.6	81377	50.9	51413
136.00	60.63	292900	9953.5	29.2	81446	51.5	50862
138.00	63.47	302593	10024.8	28.9	81597	52.1	50311
140.00	66.33	312249	10097.8	28.5	81746	52.8	49759
142.00	69.22	321867	10172.6	28.2	81857	53.5	49208
144.00	72.15	331448	10249.2	27.8	81925	54.1	48657
146.00	75.10	340994	10328.2	27.5	81981	54.8	48106
148.00	78.08	350506	10409.4	27.1	82026	55.4	47554
150.00	81.09	359987	10492.3	26.8	82054	56.1	47002
152.00	84.14	369437	10576.9	26.5	82045	56.8	46451
154.00	87.22	378857	10663.2	26.2	82036	57.5	45899
156.00	90.33	388248	10751.3	25.9	82029	58.1	45347
158.00	93.47	397614	10841.2	25.6	82022	58.9	44795
160.00	96.65	406954	10932.9	25.3	82016	59.6	44243
162.00	99.85	416271	11026.4	25.0	82011	60.3	43691
164.00	103.10	425566	11121.8	24.7	82006	61.1	43140
166.00	106.38	434841	11219.1	24.4	82001	61.9	42588
168.00	109.69	444098	11318.3	24.1	81997	62.7	42036
170.00	113.04	453339	11419.5	23.9	81993	63.5	41484
172.00	116.42	462566	11522.7	23.6	81988	64.4	40932
174.00	119.84	471780	11627.9	23.3	81984	65.3	40380
176.00	123.29	480984	11735.2	23.1	81981	66.2	39828
178.00	126.78	490179	11844.6	22.8	81977	67.1	39277
180.00	130.31	499369	11956.2	22.6	81973	68.0	38725
182.00	133.88	508555	12069.9	22.4	81969	69.0	38173
184.00	137.49	517738	12185.9	22.1	81966	70.0	37621
186.00	141.13	526923	12304.2	21.9	81962	71.1	37070
188.00	144.82	536111	12424.8	21.7	81958	72.1	36518
190.00	148.54	545304	12547.9	21.5	81955	73.2	35966
192.00	152.31	554505	12673.3	21.3	81951	74.4	35415
194.00	156.11	563717	12801.3	21.1	81948	75.6	34863
196.00	159.96	572943	12931.9	20.9	81945	76.8	34312
198.00	163.85	582164	13065.1	20.7	81942	78.0	33760
200.00	167.79	591445	13201.1	20.6	81939	79.3	33209

202.00	171.77	600727	13339.9	20.4	81936	80.7	32657
204.00	175.79	610035	13481.5	20.2	81933	82.0	32106
206.00	179.86	619371	13626.1	20.1	81930	83.5	31554
208.00	183.97	628738	13773.7	19.9	81927	84.9	31003
210.00	188.13	638140	13924.5	19.8	81925	86.5	30451
212.00	192.34	647581	14078.6	19.6	81922	88.1	29900
214.00	196.60	657064	14236.0	19.5	81919	89.7	29348
216.00	200.91	666592	14396.9	19.4	81917	91.4	28797
218.00	205.26	676170	14561.4	19.3	81914	93.2	28246
220.00	209.67	685802	14729.6	19.2	81912	95.1	27694
222.00	214.13	695492	14901.6	19.0	81910	97.0	27143
224.00	218.65	705244	15077.7	18.9	81907	99.0	26592
226.00	223.22	715063	15257.9	18.8	81905	101.1	26040
228.00	227.84	724954	15442.5	18.8	81903	103.3	25489
230.00	232.52	734922	15631.5	18.7	81901	105.6	24938
232.00	237.26	744971	15875.3	18.6	81899	108.0	24387
234.00	242.05	755108	16024.0	18.5	81897	110.4	23835
236.00	246.91	765337	16227.8	18.5	81895	113.1	23284
238.00	251.83	775665	16436.9	18.4	81893	115.8	22733
240.00	256.81	786099	16651.7	18.4	81892	118.7	22182
242.00	261.86	796643	16872.3	18.3	81890	121.7	21631
244.00	266.97	807306	17099.1	18.3	81888	124.9	21079
246.00	272.15	818094	17332.4	18.3	81887	128.2	20528
248.00	277.40	828015	17572.6	18.2	81885	131.8	19977
250.00	282.72	840078	17820.0	18.2	81883	135.5	19426
251.00	285.40	845664	17946.5	18.2	81883	137.4	19150
252.00	288.11	851288	18075.0	18.2	81882	139.4	18875
253.00	290.83	856953	18205.5	18.2	81881	141.5	18599
254.00	293.58	862658	18338.1	18.2	81880	143.6	18324
255.00	296.34	868405	18472.8	18.2	81879	145.8	18048
256.00	299.12	874195	18609.7	18.2	81879	148.1	17773
257.00	301.93	880029	18748.9	18.2	81878	150.4	17497
258.00	304.75	885904	18890.4	18.2	81877	152.8	17221
259.00	307.59	891838	19034.4	18.2	81876	155.3	16946
260.00	310.45	897811	19180.9	18.2	81875	157.9	16670
261.00	313.34	901837	19329.9	18.3	81874	160.5	16395
262.00	316.25	909913	19481.6	18.3	81873	163.3	16119
263.00	319.18	916042	19636.0	18.3	81872	166.1	15844
264.00	322.13	922226	19793.4	18.3	81870	169.0	15568
265.00	325.10	928465	19953.6	18.3	81869	172.1	15293
266.00	328.10	934762	20117.0	18.3	81867	175.2	15017
267.00	331.12	941119	20283.5	18.4	81865	178.5	14742
268.00	334.16	947537	20453.3	18.4	81863	181.9	14466
269.00	337.23	954017	20626.5	18.4	81860	185.4	14191
270.00	340.32	960564	20802.9	18.4	81510	188.3	13916
271.00	343.44	967176	20982.5	18.5	81506	192.1	13641
272.00	346.58	973857	21166.0	18.5	81502	196.0	13366
273.00	349.75	980610	21353.4	18.6	81496	200.1	13091
274.00	352.95	987436	21545.0	18.6	81490	204.4	12316
275.00	356.17	994337	21740.9	18.6	81482	208.8	12541

SUSTAINER CUTOFF

276.14	359.89	1002334	21970.7	18.7	81469	214.2	12227
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280.00	372.48	1029361	21947.5	18.6	1270	3.3	12196
284.00	385.52	1057237	21923.8	18.5	1270	3.4	12165
288.00	398.54	1084946	21900.4	18.4	1270	3.4	12133

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V NLM 310MP
280.0 402.89 1094178 21892.6 18.4 0 -0 12,123

FAST MISSILE DISPERSION

PREMATURE CUTOFF
PARAMETERS

TIME (SEC.)	GEOD. LAT. (DEG.)	LONG. (DEG.)	FREE-FALL DOWN-RANGE CROSS-RANGE (SEC.) (N.MI.) (N.MI.)
2.00	34.7960	120.5890	5.3 .0 .0
8.00	34.7960	120.5890	12.5 .0 .0
16.00	34.7960	120.5891	25.3 .0 .0
24.00	34.7959	120.5958	39.9 .0 .0
32.00	34.7955	120.6243	55.9 1.7 .0
40.00	34.7957	120.6868	72.9 4.8 -.1
48.00	34.7940	120.7920	89.7 10.0 -.0
56.00	34.7937	120.9611	107.6 18.4 -.2
72.00	34.7964	121.6043	149.1 50.2 -1.0
80.00	34.7959	122.1546	173.4 77.4 -1.7
88.00	34.7904	122.9241	200.5 115.4 -2.7
96.00	34.7741	123.9850	231.3 167.8 -3.9
104.00	34.7366	125.4517	267.5 240.4 -5.7
112.00	34.6562	127.5187	311.7 342.7 -8.4
120.00	34.4809	130.5491	369.3 493.3 -12.7
 BOOSTER CUTOFF			
122.03	34.4081	131.5483	387.1 543.0 -14.2
128.00	34.3630	132.1201	392.3 571.5 -15.0
136.00	34.2462	132.9411	398.6 612.9 -13.5
144.00	34.0959	133.7949	404.4 656.2 -10.6
152.00	33.9904	134.7356	411.0 703.5 -11.3
160.00	33.8785	135.7599	418.8 755.0 -12.8
168.00	33.7385	136.8787	427.8 811.6 -13.9
176.00	33.5780	138.1118	438.4 874.1 -15.6
184.00	33.3850	139.4788	451.0 943.7 -17.4
192.00	33.1515	141.0098	465.8 1021.9 -19.6
200.00	32.8660	142.7402	483.6 1110.9 -22.1
208.00	32.5113	144.7179	505.0 1213.2 -25.3
216.00	32.0625	147.0074	531.1 1332.7 -29.2
224.00	31.4821	149.6980	563.4 1474.6 -34.2
232.00	30.7124	152.9164	604.0 1646.6 -40.6
240.00	29.6596	156.8479	656.2 1860.5 -49.4
248.00	28.1639	161.7745	725.6 2134.7 -61.7
256.00	25.9365	168.1444	821.4 2500.8 -79.7
264.00	22.4217	176.7135	961.3 3015.1 -107.8
272.00	16.4822	-171.1551	1181.3 3787.7 -153.9
 SUSTAINER CUTOFF			
276.14	11.7400	-162.6566	1351.1 4357.4 -188.9

280.00	11.6593	-162.5182	1350.2	4366.8	-189.4	
288.00	11.4913	-162.2304	1348.2	4386.5	-190.6	
289.34	VERNIER CUTOFF					
289.34	11.4633	-162.1827	1347.9	4389.7	-190.8	

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CONVAIR ASTRONAUTICS

TABLE V

GENERAL DYNAMICS ASTRONAUTICS

SLOW-DISPERSION TRAJECTORY
FOR RANGE SAFETY

MISSILE	24B
LAUNCH ALTITUDE	269.1736 DEG. E OF N
TARGET	GEOD. LAT. 11.44647 DEG. N LONG. 162.26619 DEG. E RANGE 4386 NM
NOSE CONE IMPACT	GEOD. LAT. 11.4465 DEG. N LONG. 162.2658 DEG. E RANGE 4386 NM
NOSE CONE	AVCO MARK IV MOD. 5
GUIDANCE	ARMA LOT IV
SEA LEVEL L_{SP}	BOOSTER 254.46 SEC. SUSTAINER 219.04 SEC. VEESEIER 207.70 SEC.
PITCH PROGRAM	STEP TILT X 1.0023
STAGING CRITERION FOR BOOSTER	ARMA X DOT = 6647.87 FPS
LAUNCH WEIGHT (LIFT OFF)	272,042 LB

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SECRET

SLOW MISSILE DISPERSION

POWERED FLIGHT PARAMETERS

TIME (SEC)	RXD (FT)	RYD (FT)	RZD (FT)	VXD (FT/SEC)	VYD (FT/SEC)	VZD (FT/SEC)
.000	0	1	210	.00	-.00	.00
2.000	-0	1	237	-.01	.08	27.40
4.000	0	1	320	-.00	.16	55.87
6.000	0	1	461	.01	.24	85.47
8.000	0	2	663	.04	.31	116.26
10.000	0	3	927	.07	.39	148.31
12.000	0	3	1257	.12	.47	181.69
14.000	1	5	1655	.17	.55	216.45
16.000	1	6	2123	.24	.63	252.67
18.000	6	7	2666	.511	.73	290.32
20.000	25	9	3286	13.92	.83	329.30
22.000	65	10	3984	27.30	.95	369.47
24.000	137	12	4764	45.37	1.08	410.71
26.000	250	15	5628	68.26	1.21	452.89
28.000	413	17	6577	95.89	1.35	495.93
30.000	636	20	7612	127.33	1.47	539.98
32.000	925	23	8737	162.48	1.58	584.99
34.000	1288	26	9953	201.36	1.63	630.80
36.000	1733	30	11261	244.03	1.58	677.32
38.000	2267	33	12662	290.50	1.33	724.45
40.000	2897	35	14159	340.72	.84	771.95
42.000	3632	35	15750	394.20	-.20	819.48
44.000	4476	34	17436	450.55	-1.79	866.22
46.000	5436	29	19214	509.45	-2.49	911.48
48.000	6516	25	21081	571.10	-1.42	955.52
50.000	7722	24	23036	636.17	-.07	999.24
52.000	9063	24	25078	705.27	.84	1043.34
54.000	10546	26	27209	778.82	1.14	1088.08
56.000	12181	28	29431	856.78	.78	1133.65
58.000	13977	29	31745	939.05	-.25	1180.13
60.000	15941	27	34152	1025.92	-1.87	1227.38
62.000	18084	21	36654	1117.67	-4.00	1275.29
64.000	20415	11	39254	1214.67	-6.47	1323.81
66.000	22946	-5	41951	1316.79	-9.13	1373.35
68.000	25685	-26	44748	1423.79	-11.94	1424.19
70.000	28644	-53	47648	1536.08	-14.83	1476.23
72.000	31833	-85	50653	1653.98	-17.76	1529.29
74.000	35264	-124	53766	1777.79	-20.73	1583.20
76.000	38948	-168	56987	1907.49	-23.71	1638.18
78.000	42898	-218	60320	2043.01	-26.71	1694.40
80.000	47125	-275	63765	2184.70	-29.71	1751.68
82.000	51641	-337	67327	2332.78	-32.73	1809.82
84.000	56460	-406	71005	2487.47	-35.75	1868.62
86.000	61595	-480	74801	2648.99	-38.79	1927.94
88.000	67061	-561	78717	2817.50	-41.82	1987.63
90.000	72870	-648	82752	2993.06	-44.84	2047.74
92.000	79037	-740	86909	3175.04	-47.79	2109.39
94.000	85575	-839	91191	3363.57	-50.69	2172.60
96.000	92496	-943	95601	3558.95	-53.51	2237.28

98.000	99815	-1023	100141	3761.44	-56.28	2303.32
100.000	107547	-1168	104815	3971.38	-58.99	2370.69
102.000	115706	-1289	109625	4189.08	-61.65	2439.37
104.000	124309	-1415	114573	4414.90	-64.27	2509.35
106.000	133371	-1546	119663	4649.20	-66.85	2580.71
108.000	142911	-1682	124897	4892.24	-69.39	2653.78
110.000	152946	-1823	130279	5144.47	-71.92	2728.69
112.000	163496	-1970	135813	5406.40	-74.43	2805.51
114.000	174579	-2121	141502	5678.61	-76.94	2884.33
116.000	186217	-2277	147352	5961.74	-79.45	2965.26
118.000	198434	-2439	153365	6256.56	-81.97	3048.47
120.000	211252	-2605	159547	6564.02	-84.51	3134.19
122.000	224699	-2777	165904	6884.96	-87.10	3222.83
124.000	238801	-2954	172441	7220.30	-89.72	3314.90
126.000	253590	-3136	179165	7571.31	-92.39	3410.68
128.000	269098	-3323	186086	7939.37	-95.13	3510.53

BOOSTER CUTOFF

129.032	277393	-3422	189737	8136.48	-96.56	3563.77
130.032	285546	-3519	193291	8169.90	-97.51	3545.85
131.032	293733	-3617	196828	8203.42	-98.45	3528.02

BOOSTER JETTISON

132.032	301953	-3716	200347	8237.05	-99.37	3510.27
134.000	318236	-3913	207224	8310.64	-100.46	3478.73
136.000	334932	-4114	214150	8386.12	-100.14	3446.71
138.000	351781	-4310	221010	8462.74	-94.61	3413.16
140.000	368784	-4490	227802	8540.20	-85.43	3378.48
142.000	385942	-4650	234524	8618.35	-74.10	3343.24
144.000	403258	-4786	241174	8697.26	-62.40	3307.83
146.000	420732	-4902	247755	8777.33	-54.01	3272.60
148.000	438368	-5006	254265	8858.55	-51.04	3237.62
150.000	456167	-5109	260705	8940.62	-53.03	3202.80
152.000	474130	-5220	267076	9023.36	-57.95	3168.12
154.000	492261	-5342	273378	9106.79	-63.70	3133.62
156.000	510558	-5474	279611	9190.96	-68.70	3099.35
158.000	529025	-5615	285776	9275.90	-72.01	3065.33
160.000	547662	-5761	291873	9361.61	-73.60	3031.58
162.000	566472	-5909	297902	9448.05	-74.04	2998.08
164.000	585455	-6057	303865	9535.25	-74.13	2964.88
166.000	604613	-6206	309762	9623.23	-74.30	2931.99
168.000	623948	-6355	315593	9712.01	-74.97	2899.42
170.000	643462	-6506	321360	9801.61	-76.25	2867.17
172.000	663155	-6660	327062	9892.04	-78.02	2835.24
174.000	683031	-6818	332701	9983.31	-80.04	2803.65
176.000	703089	-6980	338277	10075.45	-82.10	2772.40
178.000	723333	-7146	343791	10168.47	-84.18	2741.48
180.000	743764	-7317	349243	10262.40	-86.14	2710.92
182.000	764383	-7491	354634	10357.24	-87.89	2680.72
184.000	785193	-7668	359966	10453.03	-89.58	2650.88
186.000	806196	-7849	365239	10549.78	-91.27	2621.42
188.000	827393	-8034	370452	10647.52	-92.95	2592.33
190.000	848787	-8221	375608	10746.26	-94.59	2563.64
192.000	870379	-8412	380707	10846.03	-96.25	2535.34
194.000	892172	-8606	385749	10946.86	-97.93	2507.44
196.000	914167	-8804	390737	11048.76	-99.63	2479.96

198.000	936367	-9005	395670	11151.77	-101.34	2452.89
200.000	958775	-9209	400549	11255.91	-103.08	2426.26
202.000	981392	-9417	405375	11361.21	-104.84	2400.07
204.000	1004220	-9628	410149	11467.69	-106.61	2374.33
206.000	1027263	-9843	414872	11575.39	-108.41	2349.04
208.000	1050523	-10062	419546	11684.33	-110.24	2324.23
210.000	1074001	-10284	424170	11794.55	-112.08	2299.89
212.000	1097702	-10510	428746	11906.08	-113.95	2276.05
214.000	1121627	-10740	433274	12018.96	-115.84	2252.71
216.000	1145778	-10974	437757	12133.21	-117.75	2229.88
218.000	1170160	-11211	442194	12248.88	-119.69	2207.59
220.000	1194775	-11423	446587	12366.00	-121.65	2185.83
224.000	1219625	-11698	450938	12484.62	-123.62	2164.63
224.000	1244714	-11947	455246	12604.77	-125.53	2144.00
226.000	1270045	-12200	459514	12726.49	-127.47	2123.95
228.000	1295621	-12457	463742	12849.84	-129.42	2104.51
230.000	1321446	-12718	467933	12974.85	-131.41	2085.68
232.000	1347522	-12983	472086	13101.58	-133.41	2067.48
234.000	1373853	-13251	476203	13230.08	-135.44	2049.94
236.000	1400443	-13524	480286	13360.39	-137.49	2033.06
238.000	1427296	-13801	484336	13492.57	-139.57	2016.88
240.000	1454415	-14082	488353	13626.69	-141.67	2001.40
242.000	1481804	-14368	492342	13762.79	-143.75	1986.65
244.000	1509467	-14657	496301	13900.94	-145.83	1972.66
246.000	1537409	-14951	500233	14041.22	-147.94	1959.44
248.000	1565634	-15249	504139	14183.68	-150.07	1947.02
250.000	1594145	-15552	508022	14328.39	-152.23	1935.43
251.000	1608510	-15704	509954	14401.62	-153.31	1929.95
252.000	1622949	-15858	511882	14475.44	-154.40	1924.69
253.000	1637461	-16013	513804	14549.87	-155.50	1919.64
254.000	1652049	-16169	515721	14624.90	-156.60	1914.83
255.000	1666711	-16326	517634	14700.57	-157.70	1910.23
256.000	1681450	-16485	519541	14776.86	-158.81	1905.87
257.000	1696265	-16644	521445	14853.80	-159.93	1901.75
258.000	1711158	-16805	523345	14931.40	-161.05	1897.86
259.000	1726128	-16966	525241	15009.67	-162.18	1894.22
260.000	1741177	-17129	527133	15088.62	-163.31	1890.83
261.000	1756306	-17293	529023	15168.26	-164.41	1887.69
262.000	1771514	-17458	530909	15248.61	-165.52	1884.80
263.000	1786803	-17624	532792	15329.67	-166.63	1882.18
264.000	1802174	-17791	534674	15411.47	-167.75	1879.82
265.000	1817626	-17959	536552	15494.01	-168.88	1877.73
266.000	1833162	-18129	538429	15577.32	-170.01	1875.92
267.000	1848781	-18299	540304	15661.39	-171.14	1874.38
268.000	1864485	-18471	542178	15746.26	-172.29	1873.14
269.000	1880274	-18644	544051	15831.93	-173.43	1872.18
270.000	1896149	-18818	545922	15918.41	-174.58	1871.53
271.000	1912111	-18993	547794	16005.74	-175.74	1871.17
272.000	1928161	-19169	549665	16093.92	-176.90	1871.13
273.000	1944299	-19347	551536	16182.96	-178.07	1871.40
274.000	1960527	-19526	553407	16272.90	-179.24	1871.99
275.000	1976845	-19705	555280	16363.74	-180.42	1872.90
276.000	1993255	-19886	557154	16455.50	-181.61	1874.16
277.000	2009756	-20069	559028	16548.21	-182.80	1875.75
278.000	2026351	-20252	560905	16641.88	-183.99	1877.69
279.000	2043040	-20436	562784	16736.53	-185.20	1879.99
280.000	2059825	-20622	564665	16832.19	-186.41	1882.65
281.000	2076705	-20809	566549	16928.87	-187.62	1885.68

282,000	2093683	-20998	568437	17026.61	-188.84	1889.09
283,000	2110759	-21187	570328	17125.42	-190.07	1892.89
284,000	2127934	-21378	572223	17225.32	-191.30	1897.08
285,000	2145210	-21569	574122	17326.35	-192.54	1901.68
286,000	2162587	-21763	576026	17428.52	-193.79	1906.69
287,000	2180067	-21957	577935	17531.87	-195.05	1912.13
288,000	2197651	-22153	579851	17636.42	-196.31	1918.00
289,000	2215340	-22350	581772	17742.20	-197.57	1924.31
290,000	2233136	-22548	583699	17849.24	-198.85	1931.08
291,000	2251039	-22748	585634	17957.57	-200.13	1938.31
292,000	2269051	-22948	587576	18067.22	-201.42	1946.02
293,000	2287174	-23150	589526	18178.22	-202.71	1954.22
294,000	2305408	-23354	591485	18290.62	-204.02	1962.92
295,000	2323756	-23558	593452	18404.43	-205.32	1972.13
296,000	2342218	-23764	595429	18519.71	-206.64	1981.87
297,000	2360796	-23972	597416	18636.49	-207.96	1992.14
298,000	2379491	-24180	599413	18754.80	-209.29	2002.98
299,000	2398306	-24390	601422	18874.70	-210.63	2014.38
300,000	2417241	-24602	603442	18996.21	-211.97	2026.36
301,000	2436299	-24814	605475	19119.39	-213.32	2038.95
302,000	2455480	-25028	607520	19244.29	-214.68	2052.15
303,000	2474788	-25244	609580	19370.95	-216.04	2065.99
304,000	2494223	-25460	611653	19499.41	-217.40	2080.48
305,000	2513787	-25678	613740	19629.75	-218.77	2095.65
306,000	2533483	-25898	615844	19762.00	-220.15	2111.50
307,000	2553312	-26119	617964	19896.23	-221.53	2128.07
308,000	2573276	-26341	620100	20032.49	-222.92	2145.37
309,000	2593377	-26564	622255	20170.85	-224.30	2163.43
310,000	2613618	-26790	624427	20311.38	-225.69	2182.26
311,000	2634001	-27016	626619	20454.14	-227.09	2201.91
312,000	2654527	-27244	628832	20599.20	-228.48	2222.38
313,000	2675200	-27473	631065	20746.64	-229.87	2243.71
314,000	2696021	-27703	633319	20896.54	-231.26	2265.93
315,000	2716994	-27935	635597	21048.98	-232.65	2289.06
316,000	2738120	-28169	637898	21204.05	-234.04	2313.14
317,000	2759403	-28403	640224	21361.83	-235.42	2338.20
318,000	2780845	-28639	642575	21522.43	-236.80	2364.28
319,000	2802449	-28877	644953	21685.95	-238.16	2391.41
320,000	2824217	-29116	647358	21852.49	-239.52	2419.63
321,000	2846154	-29356	649792	22021.60	-240.87	2448.78
322,000	2868262	-29598	652256	22193.75	-242.21	2479.02

SUSTAINER CUTOFF

323,113	2893083	-29868	655035	22389.39	-243.68	2514.13
324,000	2912931	-30085	657252	22388.72	-245.31	2486.57
328,000	3002479	-31081	666950	22385.42	-252.66	2362.40
332,000	3092014	-32106	676151	22381.64	-260.00	2238.54
336,000	3181532	-33161	684859	22377.39	-267.35	2114.99

VERNIER CUTOFF

339,409	3257819	-34083	691890	22373.40	-273.65	2009.92
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POWERED FLIGHT PARAMETERS

TIME (SEC)	RANGE (N MI)	ALT (FT)	VELOCITY (FT/SEC)	ANGLE (DEGREES)	THRUST (LBS)	AC XI (FPS2)	WEIGHT (LBS)
0.00	0.00	210	0	0	385445	45.5	272042
2.00	0.00	237	27.4	90.0	385398	46.1	268934
4.00	0.00	320	55.9	90.0	385557	46.6	265827
6.00	0.00	461	85.5	90.0	385924	47.2	262719
8.00	0.00	663	116.3	90.0	386484	47.8	259612
10.00	0.00	927	148.3	90.0	387249	48.4	256505
12.00	0.00	1257	181.7	90.0	388219	49.1	253397
14.00	0.00	1655	216.5	89.9	389392	49.8	250288
16.00	0.00	2124	252.7	89.8	390770	50.6	247177
18.00	0.00	2666	290.4	89.0	392350	51.4	244066
20.00	0.00	3286	329.6	87.6	394073	52.2	240952
22.00	0.01	3984	370.5	85.8	396029	53.0	237837
24.00	0.02	4764	413.2	83.7	398172	53.9	234719
26.00	0.04	5628	458.0	81.4	400500	54.9	231599
28.00	0.07	6576	505.1	79.1	402991	55.8	228476
30.00	0.10	7612	554.8	76.7	405631	56.8	225351
32.00	0.15	8737	607.1	74.5	407912	57.8	222224
34.00	0.21	9953	662.2	72.3	410131	58.8	219097
36.00	0.29	11261	719.9	70.2	412479	59.8	215972
38.00	0.37	12663	780.5	68.2	414890	60.7	212848
40.00	0.48	14159	843.8	66.2	417313	61.6	209725
42.00	0.60	15751	909.4	64.3	419660	62.1	206603
44.00	0.74	17437	976.4	62.5	421864	62.1	203485
46.00	0.89	19215	1044.2	60.8	424077	62.1	200369
48.00	1.07	21082	1113.2	59.2	426368	62.5	197256
50.00	1.19	23037	1184.6	57.5	428700	63.5	194145
52.00	1.33	25080	1259.4	56.0	431076	64.9	191036
54.00	1.68	27212	1338.1	54.4	433416	66.4	187926
56.00	1.88	29435	1421.0	53.0	435678	68.0	184818
58.00	2.22	31750	1508.1	51.5	437817	69.7	181710
60.00	2.52	34159	1599.7	50.2	439905	71.4	178602
62.00	2.91	36663	1695.8	48.8	441863	73.3	175494
64.00	3.31	39264	1796.7	47.5	443720	75.3	172387
66.00	3.71	41963	1902.7	46.3	445454	77.4	169280
68.00	4.20	44764	2013.9	45.1	447012	79.6	166172
70.00	4.64	47668	2130.5	43.9	448496	81.9	163064
72.00	5.18	50678	2252.7	42.8	449787	84.2	159956
74.00	5.76	53796	2380.6	41.8	451006	86.7	156847
76.00	6.37	57023	2514.5	40.8	452078	89.2	153738
78.00	7.03	60364	2654.4	39.8	453081	91.9	150628
80.00	7.72	63819	2800.4	38.8	453965	94.5	147517
82.00	8.46	67390	2952.7	37.9	454756	97.3	144405
84.00	9.25	71082	3111.4	37.1	455443	100.1	141293
86.00	10.09	74892	3276.5	36.2	456073	103.0	138180
88.00	10.99	78824	3448.3	35.4	456621	105.9	135066
90.00	11.94	82879	3626.8	34.6	457104	109.0	131952
92.00	12.94	87058	3812.2	33.8	457500	112.1	128837
94.00	14.02	91366	4004.5	33.1	457846	115.3	125720
96.00	15.15	95804	4204.1	32.4	458157	118.6	122604
98.00	16.35	100378	4411.0	31.8	458444	122.0	119486
100.00	17.61	105090	4625.5	31.1	458707	125.6	116367

102.00	18.94	109943	4848.0	20.5	458943	129.3	113248
104.00	20.34	114941	5078.6	29.9	459174	133.2	110127
106.00	21.82	120086	5317.9	29.4	459404	137.3	107006
108.00	23.38	125382	5566.1	28.9	459635	141.7	103883
110.00	25.01	130835	5823.8	28.4	459874	146.3	100758
112.00	26.74	136447	6091.4	27.9	460086	151.1	97633
114.00	28.54	142226	6369.5	27.4	460297	156.3	94505
116.00	30.43	148174	6658.9	26.9	460530	161.8	91376
118.00	32.42	154299	6960.2	26.5	461004	167.8	88244
120.00	34.50	160606	7274.4	26.1	461557	174.2	85108
122.00	36.69	167100	7602.4	25.7	462138	181.2	81967
124.00	38.98	173792	7945.4	25.3	462795	188.8	78821
126.00	41.38	180689	8304.6	24.9	463536	197.0	75670
128.00	43.90	187801	8681.4	24.6	464336	206.0	72513

BOOSTER CUTOFF

129.03	45.24	191558	8883.2	24.4	464782	211.0	70881
130.03	46.56	195221	8906.7	24.2	79726	36.5	70621
131.03	47.89	198870	8930.4	24.1	79758	36.7	70361

BOOSTER JETTISON

132.03	49.22	202504	8954.4	23.9	79789	36.8	70101
134.00	51.86	209619	9009.9	23.6	79346	41.0	62455
136.00	54.56	216802	9067.3	23.3	79458	41.4	61934
138.00	57.29	273934	9125.6	22.9	79580	41.8	61414
140.00	60.04	231014	9184.6	22.6	79687	42.2	60894
142.00	62.81	238041	9244.4	22.2	79761	42.6	60373
144.00	65.60	245013	9305.3	21.9	79812	43.0	59853
146.00	68.42	251932	9367.7	21.6	79856	43.3	59332
148.00	71.27	258798	9431.8	21.3	79893	43.7	58812
150.00	74.14	265613	9497.1	20.9	79925	44.1	58291
152.00	77.04	272376	9563.5	20.6	79947	44.5	57770
154.00	79.96	279089	9631.1	20.3	79938	44.9	57249
156.00	82.90	285752	9699.7	20.0	79930	45.3	56728
158.00	85.88	292367	9769.5	19.7	79923	45.7	56208
160.00	88.88	298934	9840.5	19.4	79916	46.1	55687
162.00	91.90	305455	9912.6	19.1	79910	46.6	55166
164.00	94.95	311930	9985.8	18.9	79904	47.0	54645
166.00	98.03	318361	10060.3	18.6	79898	47.5	54124
168.00	101.14	324748	10135.8	18.3	79893	47.9	53603
170.00	104.27	331094	10212.6	18.0	79888	48.4	53082
172.00	107.43	337398	10290.6	17.8	79883	48.9	52561
174.00	110.62	343662	10369.8	17.5	79878	49.3	52040
176.00	113.83	349888	10450.2	17.3	79874	49.8	51519
178.00	117.08	356077	10531.9	17.0	79869	50.3	50998
180.00	120.35	362229	10614.8	16.8	79865	50.9	50477
182.00	123.65	368347	10698.9	16.6	79860	51.4	49956
184.00	126.99	374432	10784.3	16.3	79856	51.9	49435
186.00	130.35	380484	10871.0	16.1	79851	52.5	48915
188.00	133.74	386505	10958.9	15.9	79847	53.0	48394
190.00	137.16	392497	11048.2	15.7	79843	53.6	47873
192.00	140.61	398462	11138.8	15.5	79839	54.2	47352
194.00	144.09	404400	11230.8	15.3	79835	54.8	46832
196.00	147.61	410313	11324.1	15.1	79831	55.4	46311
198.00	151.15	416203	11418.8	14.9	79827	56.0	45790
200.00	154.73	422071	11514.9	14.7	79824	56.7	45270

202.00	158.34	427919	11612.4	14.6	79820	57.3	44749
204.00	161.98	433749	11711.4	14.4	79816	58.0	44228
206.00	165.65	439561	11811.8	14.2	79812	58.7	43708
208.00	169.36	445358	11913.8	14.1	79808	59.4	43187
210.00	173.10	451142	12017.2	13.9	79805	60.1	42667
212.00	176.88	456915	12122.2	13.8	79801	60.9	42146
214.00	180.69	462678	12228.8	13.6	79797	61.6	41626
216.00	184.53	468433	12337.0	13.5	79794	62.4	41105
218.00	188.41	474182	12446.8	13.4	79790	63.2	40585
220.00	192.33	479927	12558.3	13.2	79787	64.0	40065
222.00	196.28	485671	12671.5	13.1	79783	64.9	39544
224.00	200.27	491414	12786.4	13.0	79780	65.7	39024
226.00	204.29	497160	12903.1	12.9	79776	66.6	38504
228.00	208.36	502911	13021.7	12.8	79773	67.5	37983
230.00	212.46	508668	13142.1	12.7	79770	68.4	37463
232.00	216.60	514435	13264.4	12.6	79766	69.4	36943
234.00	220.78	520214	13388.6	12.5	79763	70.4	36423
236.00	224.99	526006	13514.9	12.4	79759	71.4	35902
238.00	229.25	531815	13643.2	12.3	79756	72.5	35382
240.00	233.55	537643	13773.6	12.2	79753	73.5	34862
242.00	237.89	543493	13906.2	12.2	79750	74.6	34342
244.00	242.27	549368	14041.0	12.1	79746	75.8	33822
246.00	246.70	555270	14178.0	12.1	79743	77.0	33302
248.00	251.16	561202	14317.5	12.0	79740	78.2	32782
250.00	255.68	567169	14459.3	12.0	79737	79.4	32261
251.00	257.95	570165	14531.2	11.9	79736	80.1	32001
252.00	260.23	573171	14603.7	11.9	79734	80.7	31741
253.00	262.53	576187	14676.8	11.9	79733	81.4	31481
254.00	264.83	579213	14750.6	11.9	79731	82.1	31221
255.00	267.15	582251	14825.0	11.9	79730	82.8	30961
256.00	269.48	585298	14900.1	11.8	79729	83.5	30701
257.00	271.82	588359	14975.9	11.8	79727	84.2	30441
258.00	274.17	591431	15052.4	11.8	79726	84.9	30181
259.00	276.53	594515	15129.6	11.8	79724	85.6	29921
260.00	278.91	597612	15207.5	11.8	79723	86.4	29661
261.00	281.30	600723	15286.2	11.8	79722	87.2	29401
262.00	283.70	603848	15365.5	11.8	79720	87.9	29141
263.00	286.11	606988	15445.7	11.8	79719	88.7	28882
264.00	288.54	610142	15526.6	11.8	79718	89.5	28622
265.00	290.97	613311	15608.3	11.8	79716	90.3	28362
266.00	293.42	616496	15690.8	11.8	79715	91.2	28102
267.00	295.88	619698	15774.1	11.8	79714	92.0	27842
268.00	298.36	622917	15858.2	11.8	79712	92.9	27582
269.00	300.85	626153	15943.2	11.8	79711	93.8	27322
270.00	303.35	629407	16029.0	11.8	79710	94.7	27062
271.00	305.86	632680	16115.7	11.8	79709	95.6	26802
272.00	308.39	635972	16203.3	11.8	79708	96.5	26542
273.00	310.93	639283	16291.8	11.8	79706	97.5	26282
274.00	313.48	642615	16381.2	11.8	79705	98.5	26022
275.00	316.05	645967	16471.6	11.8	79704	99.4	25762
276.00	318.63	649341	16562.9	11.8	79703	100.5	25502
277.00	321.22	652737	16655.2	11.8	79702	101.5	25242
278.00	323.83	656156	16748.5	11.8	79701	102.5	24983
279.00	326.46	659599	16842.8	11.8	79700	103.6	24723
280.00	329.09	663365	16938.2	11.9	79698	104.7	24463
281.00	331.74	666556	17034.6	11.9	79697	105.8	24203
282.00	334.41	670073	17132.1	11.9	79696	107.0	23943
283.00	337.09	673615	17230.8	11.9	79695	108.2	23683

284.00	339.79	677185	17330.5	11.9	79694	109.4	23423
285.00	342.50	680781	17431.5	12.0	79693	110.6	23163
286.00	345.22	684407	17533.6	12.0	79692	111.8	22903
287.00	347.96	688061	17636.9	12.0	79691	113.1	22644
288.00	350.72	691745	17741.5	12.0	79690	114.4	22384
289.00	353.49	695400	17847.3	12.1	79689	115.8	22124
290.00	356.28	699206	17954.5	12.1	79688	117.2	21864
291.00	359.08	702985	18063.0	12.1	79687	118.6	21604
292.00	361.90	706797	18172.8	12.2	79686	120.0	21344
293.00	364.74	710643	18284.1	12.2	79685	121.5	21084
294.00	367.59	714523	18396.8	12.2	79685	123.0	20825
295.00	370.46	718440	18510.9	12.3	79684	124.6	20565
296.00	373.35	722394	18626.6	12.3	79683	126.1	20305
297.00	376.25	726384	18743.8	12.4	79682	127.8	20045
298.00	379.17	730414	18862.6	12.4	79681	129.5	19785
299.00	382.11	734485	18983.1	12.5	79680	131.2	19525
300.00	385.07	738595	19105.2	12.5	79679	132.9	19266
301.00	388.04	742747	19229.0	12.6	79678	134.8	19006
302.00	391.03	746942	19354.6	12.6	79677	136.6	18746
303.00	394.04	751182	19482.0	12.7	79676	138.5	18486
304.00	397.07	755467	19611.3	12.7	79675	140.5	18226
305.00	400.12	759798	19742.5	12.8	79675	142.5	17966
306.00	403.19	764177	19875.7	12.8	79674	144.6	17707
307.00	406.27	768605	20010.9	12.9	79673	146.8	17447
308.00	409.38	773084	20148.3	12.9	79672	149.0	17187
309.00	412.51	777613	20287.8	13.0	79671	151.3	16927
310.00	415.65	782196	20429.5	13.1	79670	153.6	16667
311.00	418.82	786833	20573.6	13.1	79669	156.1	16408
312.00	422.01	791526	20720.0	13.2	79667	158.6	16148
313.00	425.22	796276	20868.9	13.3	79666	161.2	15888
314.00	428.45	801085	21020.3	13.3	79665	163.8	15628
315.00	431.70	805955	21174.4	13.4	79663	166.6	15368
316.00	434.98	810887	21331.1	13.5	79661	169.5	15109
317.00	438.28	815882	21490.7	13.5	79659	172.4	14849
318.00	441.60	820943	21653.2	13.6	79657	175.5	14589
319.00	444.94	826072	21818.7	13.7	79655	178.7	14329
320.00	448.31	831270	21987.3	13.8	79652	182.0	14070
321.00	451.70	836539	22158.6	13.9	79301	184.6	13810
322.00	455.12	841281	22333.1	14.0	79297	188.1	13551

SUSTAINER CUTOFF

323.11	458.95	847918	22531.4	14.1	79293	192.2	13263
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324.00	462.02	852758	22527.7	14.0	1270	3.1	13256
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328.00	475.83	874511	22511.1	13.9	1270	3.1	13224
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332.00	489.63	896120	22494.8	13.9	1270	3.1	13193
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336.00	503.40	917587	22478.7	13.8	1270	3.1	13161
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VERNIER CUTOFF

339.41	515.13	935772	22465.2	13.7	1270	3.1	13134
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SLOW MISSILE DISPERSION

PREMATURE CUTOFF
PARAMETERS

TIME (SEC.)	GEOD. LAT. (DEG.)	LONG. (DEG.)	FREE-FALL DOWN-RANGE CROSS-RANGE		
			TIME (SEC.)	DISTANCE (N.MI.)	DISTANCE (N.MI.)
2.00	34.7960	120.5890	5.1	.0	.0
8.00	34.7960	120.5890	11.0	.0	.0
16.00	34.7960	120.5891	21.8	.0	.0
24.00	34.7959	120.5946	34.2	.0	.0
32.00	34.7956	120.6180	47.8	1.5	.0
40.00	34.7952	120.6693	62.2	4.0	-.0
48.00	34.7949	120.7564	76.7	8.3	-.1
56.00	34.7932	120.8884	90.9	14.8	-.1
72.00	34.7943	121.3630	121.8	38.2	-.6
80.00	34.7947	121.7511	139.0	57.4	-1.1
88.00	34.7932	122.2772	157.4	83.4	-1.7
96.00	34.7873	122.9769	177.2	118.0	-2.6
104.00	34.7727	123.8984	199.4	163.6	-3.7
112.00	34.7426	125.1146	224.7	223.7	-5.1
120.00	34.6839	126.7436	254.5	304.4	-7.0
128.00	34.5691	128.9974	291.7	416.2	-9.8
BOOSTER CUTOFF					
129.03	34.5476	129.3508	297.2	433.7	-10.3
136.00	34.5164	129.8081	298.7	456.5	-10.8
144.00	34.4420	130.3604	300.2	484.1	-9.3
152.00	34.3885	130.9435	301.9	513.3	-9.4
160.00	34.3457	131.5624	303.9	544.1	-10.5
168.00	34.2849	132.2186	306.4	576.9	-11.0
176.00	34.2210	132.9198	309.5	612.0	-11.9
184.00	34.1485	133.6718	313.2	649.7	-12.8
192.00	34.0645	134.4820	317.8	690.4	-13.8
200.00	33.9678	135.3598	323.2	734.5	-14.8
208.00	33.8558	136.3165	329.6	782.7	-16.0
216.00	33.7249	137.3662	337.4	835.8	-17.4
224.00	33.5704	138.5264	346.6	894.7	-19.0
232.00	33.3861	139.8179	357.7	960.4	-20.9
240.00	33.1631	141.2723	371.0	1034.8	-23.1
248.00	32.8894	142.9262	387.1	1119.8	-25.7
256.00	32.5481	144.8299	406.7	1218.3	-28.8
264.00	32.1134	147.0523	431.0	1334.2	-32.7
272.00	31.5468	149.6893	461.3	1473.1	-37.7
280.00	30.7873	152.8787	499.9	1643.5	-44.3
288.00	29.7342	156.8248	550.2	1857.9	-53.2
296.00	28.2119	161.8415	617.9	2137.0	-65.7
304.00	25.8964	168.4341	712.7	2516.1	-84.3
312.00	22.1467	177.4629	853.1	3059.7	-113.6
320.00	15.6095	-169.4849	1078.2	3897.2	-162.0

Report 1200-01					
A					
323.11	SUSTAINER CUTOFF				
	11.7800	-162.7320	1204.8	4352.3	-188.4
328.00	11.6708	-162.5462	1203.5	4365.1	-189.1
336.00	11.4915	-162.2417	1201.5	4385.9	-190.2
VERNIER CUTOFF					
339.41	11.4152	-162.1121	1200.7	4394.8	-190.8

~~SECRET~~

REPORT AE62-0110

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CONVAIR ASTRONAUTICS

TABLE VI

GENERAL DYNAMICS ASTRONAUTICS

NOSE-LEFT-DISPERSION TRAJECTORY
FOR RANGE SAFETY

MISSILE	243
LAUNCH AZIMUTH	269.1736 DEG. E OF N
TARGET	GEOD LAT. 11.44647 DEG. N LONG. 162.26619 DEG. E RANGE 4386 KM
NOSE CONE IMPACT	GEOD LAT. 11.4035 DEG. N LONG. 162.2925 DEG. E RANGE 4386 KM
NOSE CONE	AVCO MARK IV MOD. 5
GUIDANCE	ARMA LOT IV
SEA LEVEL L_{sp}	BOOSTER 253.23 SEC. (NOMINAL) SUSTAINER 215.46 SEC. (NOMINAL) VERNIER 207.70 SEC. (NOMINAL)
PITCH PROGRAM	STEP TILT X 0.97
STAGING CRITERION FOR BOOSTER	ARMA X DOT = 6647.87 FTS
LAUNCH WEIGHT (LIFT OFF)	268,242.0 LB

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FORM NO. A-722-3

~~SECRET~~

NOSE LEFT DISPERSION

POWERED FLIGHT PARAMETERS

TIME (SEC)	RXD (FT)	RYD (FT)	RZD (FT)	VXD (FT/SEC)	VYD (FT/SEC)	VZD (FT/SEC)
0.000	0	1	210	.00	-.00	.00
2.000	-0	1	240	-.01	.15	30.30
4.000	0	1	332	.03	.37	61.75
6.000	0	2	488	.08	.68	94.42
8.000	0	4	710	.16	1.06	128.38
10.000	1	7	1002	.26	1.54	163.70
12.000	2	10	1366	.39	2.14	200.45
14.000	3	15	1805	.53	2.87	238.70
16.000	4	22	2322	1.22	3.75	278.54
18.000	10	31	2920	5.76	4.88	319.93
20.000	30	42	3602	14.84	6.29	362.77
22.000	73	56	4372	28.62	7.99	406.95
24.000	148	74	5231	47.23	10.00	452.34
26.000	265	96	6182	70.80	12.35	498.82
28.000	434	123	7227	99.28	15.04	546.29
30.000	664	156	8368	131.72	18.06	594.93
32.000	964	196	9607	167.97	21.40	644.59
34.000	1339	242	10947	208.08	25.02	695.16
36.000	1798	296	12389	252.12	29.07	746.52
38.000	2350	359	13933	300.07	33.69	798.37
40.000	3001	431	15582	351.73	38.70	850.15
42.000	3758	514	17333	405.58	44.22	901.27
44.000	4625	610	19186	461.83	52.18	950.96
46.000	5607	724	21137	520.86	62.66	999.79
48.000	6711	861	23185	583.38	74.11	1048.91
50.000	7944	1021	25333	649.94	86.22	1098.97
52.000	9314	1207	27582	720.90	99.20	1150.18
54.000	10830	1419	29934	796.53	113.01	1202.48
56.000	12503	1659	32392	876.72	127.66	1255.96
58.000	14340	1930	34959	961.44	143.36	1310.79
60.000	16352	2234	37637	1051.12	159.37	1366.85
62.000	18549	2562	40427	1147.30	167.97	1423.76
64.000	20945	2902	43332	1249.95	171.94	1481.45
66.000	23553	3249	46354	1358.45	174.01	1540.40
68.000	26383	3598	49495	1472.54	174.95	1601.03
70.000	29447	3948	52759	1592.50	175.03	1663.19
72.000	32757	4298	56149	1718.63	174.85	1726.80
74.000	36326	4647	59667	1851.18	174.54	1791.69
76.000	40166	4996	63316	1990.10	174.20	1858.10
78.000	44290	5344	67100	2135.30	173.89	1926.21
80.000	48711	5691	71022	2287.06	173.68	1995.85
82.000	53443	6039	75085	2445.62	173.65	2066.85
84.000	58499	6386	79290	2611.20	173.84	2139.06
86.000	63893	6734	83641	2784.01	174.42	2212.35
88.000	69640	7084	88141	2964.28	175.77	2286.64
90.000	75755	7438	92789	3152.10	177.82	2362.00
92.000	82253	7796	97590	3346.90	180.51	2439.46
94.000	89147	8160	102548	3548.89	183.79	2519.12
96.000	96453	8532	107668	3758.42	187.66	2600.92

98.000	104186	8911	112953	3975.89	192.06	2684.06
100.000	112362	9300	118409	4201.71	196.95	2770.95
102.000	120999	9699	124038	4436.30	202.34	2859.23
104.000	130114	10110	129847	4680.16	208.18	2949.78
106.000	139726	10532	135839	4933.79	214.45	3042.72
108.000	149856	10968	142020	5197.60	221.12	3138.49
110.000	160524	11417	148395	5472.23	228.20	3237.29
112.000	171752	11881	154971	5758.40	235.68	3339.29
114.000	183566	12360	161755	6056.94	243.57	3444.72
116.000	195989	12856	168752	6368.81	251.89	3553.83
118.000	209050	13368	175972	6695.11	260.67	3666.94
120.000	222780	13899	183423	7037.22	269.90	3784.48
122.000	237211	14448	191114	7396.41	279.62	3907.10
124.000	252378	15017	199055	7774.13	289.94	4035.53

BOOSTER CUTOFF						
125.532	264518	15468	205316	8077.12	298.29	4138.21
126.532	272613	15766	209446	8111.81	298.59	4122.94
127.032	276673	15916	211506	8129.20	298.75	4115.34

BOOSTER JETTISON						
128.532	288906	16364	217662	8181.53	299.24	4092.70
130.000	300959	16804	223655	8238.83	300.03	4073.60
132.000	317515	17405	231777	8317.50	300.49	4047.81
134.000	334230	18002	239845	8398.06	295.60	4019.74
136.000	351108	18584	247854	8480.18	285.71	3989.26
138.000	368151	19143	255801	8563.47	272.80	3957.43
140.000	385363	19674	263684	8647.75	258.13	3924.93
142.000	402743	20175	271501	8732.94	242.36	3892.17
144.000	420295	20643	279252	8818.98	225.93	3859.39
146.000	438020	21078	286938	8905.89	209.10	3826.74
148.000	455919	21479	294560	8993.67	192.09	3794.31
150.000	473995	21846	302116	9082.32	174.94	3762.17
152.000	492249	22179	309608	9171.84	157.64	3730.32
154.000	510683	22477	317038	9262.22	140.18	3698.80
156.000	529298	22740	324404	9353.47	122.57	3667.60
158.000	548097	22967	331708	9445.60	104.81	3636.75
160.000	567081	23159	338951	9538.63	86.88	3606.46
162.000	586252	23314	346133	9632.60	68.87	3576.14
164.000	605612	23434	353256	9727.54	50.85	3546.40
166.000	625163	23518	360319	9823.46	32.82	3517.06
168.000	644907	23566	367324	9920.40	14.80	3488.11
170.000	664846	23577	374272	10018.37	-3.23	3459.57
172.000	684981	23552	381163	10117.41	-21.25	3431.44
174.000	705316	23493	387998	10217.75	-37.56	3403.82
176.000	725853	23407	394778	10319.79	-47.75	3376.83
178.000	745595	23307	401506	10423.28	-50.81	3350.31
180.000	767547	23206	408180	10527.92	-49.09	3324.13
182.000	788709	23111	414802	10633.72	-45.95	3298.32
184.000	810083	23022	421373	10740.78	-43.78	3272.93
186.000	831672	22935	427894	10849.15	-43.65	3248.00
188.000	853480	22846	434366	10958.81	-45.39	3223.52
190.000	875509	22753	440789	11069.78	-48.04	3199.52
192.000	897760	22654	447164	11182.09	-50.82	3176.03
194.000	920238	22550	453493	11295.77	-53.43	3153.06
196.000	942944	22441	459776	11410.86	-55.42	3130.62

198.000	965882	22328	466016	11527.39	-56.96	3108.73
200.000	989055	22213	472212	11645.41	-58.26	3087.39
202.000	1012465	22095	478366	11764.95	-59.54	3066.63
204.000	1036116	21975	484479	11886.06	-60.80	3046.46
206.000	1060010	21852	490552	12008.78	-62.12	3026.89
208.000	1084152	21726	496587	12133.16	-63.64	3007.94
210.000	1108544	21597	502584	12259.25	-65.34	2989.63
212.000	1133190	21465	508546	12387.09	-67.08	2971.97
214.000	1158093	21329	514472	12516.74	-68.81	2954.99
216.000	1183258	21189	520366	12648.26	-70.55	2938.71
218.000	1208688	21047	526228	12781.69	-72.30	2923.13
220.000	1234386	20900	532059	12917.11	-74.12	2908.29
222.000	1260357	20750	537862	13054.56	-75.92	2894.21
224.000	1286606	20597	543636	13194.12	-77.71	2880.91
226.000	1313135	20439	549386	13335.86	-79.52	2868.41
228.000	1339951	20279	555111	13479.84	-81.36	2856.75
230.000	1367056	20114	560813	13626.15	-83.18	2845.94
232.000	1394457	19946	566495	13774.85	-85.06	2836.01
234.000	1422157	19774	572158	13926.04	-86.95	2827.00
236.000	1450163	19598	577803	14079.81	-88.80	2818.93
238.000	1478478	19418	583434	14236.23	-90.74	2811.84
240.000	1507109	19235	589052	14395.42	-92.66	2805.77
242.000	1536062	19048	594658	14557.47	-94.57	2800.74
244.000	1565341	18857	600255	14722.49	-96.56	2796.80
246.000	1594954	18662	605846	14890.59	-98.50	2793.99
248.000	1624906	18463	611432	15061.90	-100.48	2792.35
250.000	1655203	18260	617016	15236.54	-102.50	2791.92
251.000	1670484	18157	619808	15325.15	-103.49	2792.18
252.000	1685854	18053	622601	15414.65	-104.48	2792.76
253.000	1701314	17948	625394	15505.05	-105.51	2793.67
254.000	1716865	17842	628188	15596.37	-106.55	2794.92
255.000	1732507	17735	630984	15688.63	-107.58	2796.51
256.000	1748242	17626	633781	15781.85	-108.60	2798.45
257.000	1764071	17517	636581	15876.05	-109.61	2800.74
258.000	1779994	17407	639382	15971.25	-110.64	2803.40
259.000	1796014	17296	642188	16067.48	-111.70	2806.43
260.000	1812130	17184	644996	16164.76	-112.76	2809.84
261.000	1828343	17071	647808	16263.10	-113.81	2813.64
262.000	1844656	16956	650623	16362.54	-114.84	2817.84
263.000	1861069	16841	653443	16463.10	-115.87	2822.45
264.000	1877583	16725	656268	16564.81	-116.95	2827.47
265.000	1894199	16607	659098	16667.68	-118.04	2832.91
266.000	1910918	16488	661934	16771.76	-119.11	2838.79
267.000	1927743	16369	664776	16877.06	-120.18	2845.12
268.000	1944673	16248	667624	16983.62	-121.23	2851.90
269.000	1961710	16126	670480	17091.47	-122.30	2859.15
270.000	1978856	16003	673343	17200.64	-123.42	2866.88
271.000	1996112	15880	676214	17311.16	-124.52	2875.10
272.000	2013479	15754	679093	17423.07	-125.61	2883.82
273.000	2030959	15628	681982	17536.41	-126.69	2893.06
274.000	2048552	15501	684879	17651.20	-127.76	2902.82
275.000	2066261	15373	687787	17767.49	-128.86	2913.13
276.000	2084088	15243	690706	17885.32	-129.95	2924.00
277.000	2102033	15113	693636	18004.73	-131.07	2935.44
278.000	2120098	14981	696577	18125.75	-132.18	2947.46
279.000	2138285	14848	699531	18248.45	-133.30	2960.09
280.000	2156595	14715	702498	18372.86	-134.43	2973.34
281.000	2175031	14580	705477	18499.04	-135.54	2987.23

282.000	2193594	14443	708472	18627.02	-136.72	3001.77
283.000	2212286	14306	711482	18756.88	-137.90	3016.99
284.000	2231108	14168	714506	18888.65	-139.07	3032.91
285.000	2250063	14028	717548	19022.41	-140.21	3049.54
286.000	2269154	13887	720606	19158.20	-141.34	3066.91
287.000	2288381	13745	723682	19296.10	-142.45	3085.05
288.000	2307747	13602	726776	19436.16	-143.63	3103.96
289.000	2327254	13458	729890	19578.47	-144.80	3123.69
290.000	2346904	13313	733024	19723.08	-145.95	3144.26
291.000	2366700	13166	736179	19870.08	-147.09	3165.69
292.000	2386645	13019	739355	20019.55	-148.28	3188.01
293.000	2406740	12870	742555	20171.57	-149.48	3211.26
294.000	2426989	12720	745778	20326.23	-150.64	3235.47
295.000	2447394	12568	749026	20483.62	-151.83	3260.66
296.000	2467957	12416	752300	20643.83	-153.06	3286.88
297.000	2488682	12262	755600	20806.98	-154.26	3314.16
298.000	2509572	12107	758928	20973.17	-155.42	3342.54
299.000	2530630	11951	762286	21142.51	-156.60	3372.07
300.000	2551858	11794	765673	21314.56	-157.82	3402.58
301.000	2573260	11636	769091	21489.80	-159.01	3434.25
302.000	2594839	11476	772542	21668.56	-160.27	3467.19
303.000	2616598	11315	776026	21850.97	-161.50	3501.46

SUSTAINER CUTOFF

303.582	2629352	11221	778071	21958.92	-162.19	3522.04
304.000	2638526	11133	779539	21958.87	-162.97	3509.17
308.000	2726360	10486	793330	21958.12	-170.40	3386.09
312.000	2814190	9790	806628	21956.92	-177.82	3263.34
316.000	2902015	9064	819437	21955.27	-185.23	3140.92

VERNIER CUTOFF

317.896	2943636	8709	825337	21954.33	-188.73	3083.01
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POWERED FLIGHT PARAMETERS

TIME (SEC)	RANGE (IN MI)	ALT (FT)	VELOCITY (FT/SEC)	ANGLE (DEGREES)	FLT PATH		AC XI (FPS2)	WEIGHT (LBS)
					THRUST (LBS)	AC XI (FPS2)		
2.00	.00	210	.0	.0	391961	47.0	268242	
2.20	.00	240	30.3	89.9	391964	47.5	265060	
2.40	.00	332	61.7	89.8	392183	48.1	261879	
2.60	.00	488	94.4	89.8	392616	48.8	258698	
2.80	.00	710	128.4	89.7	393271	49.4	255517	
2.10.00	.00	1002	163.7	89.6	394148	50.1	252335	
2.12.00	.00	1366	200.5	89.6	395251	50.8	249152	
2.14.00	.00	1805	238.7	89.5	396576	51.6	245968	
2.16.00	.00	2322	278.6	89.4	398126	52.4	242783	
2.18.00	.00	2920	320.0	88.8	399896	53.3	239595	
2.20.00	.01	3602	363.1	87.5	401826	54.1	236406	
2.22.00	.01	4372	408.0	85.9	404006	55.1	233215	
2.24.00	.03	5231	454.9	83.9	406390	56.0	230021	
2.26.00	.05	6182	504.0	81.8	408961	57.1	226824	
2.28.00	.07	7227	555.4	79.6	411711	58.1	223624	
2.30.00	.11	8368	609.6	77.4	414320	59.2	220422	
2.32.00	.16	9608	666.5	75.3	416703	60.2	217219	
2.34.00	.22	10947	726.1	73.2	419130	61.3	214018	
2.36.00	.30	12389	788.5	71.3	421674	62.3	210818	
2.38.00	.39	13934	853.6	69.3	424234	63.2	207619	
2.40.00	.50	15582	920.9	67.4	426740	63.6	204422	
2.42.00	.62	17334	989.3	65.7	429046	63.5	201228	
2.44.00	.77	19187	1058.5	64.0	431407	63.5	198037	
2.46.00	.93	21138	1129.1	62.4	433885	64.1	194849	
2.48.00	1.11	23186	1202.5	60.8	436399	65.4	191663	
2.50.00	1.19	25335	1279.7	59.2	438956	66.9	188477	
2.52.00	1.45	27584	1361.0	57.7	441450	68.6	185293	
2.54.00	1.68	29937	1446.8	56.3	443817	70.3	182108	
2.56.00	1.97	32397	1537.0	54.9	446130	72.1	178924	
2.58.00	2.30	34964	1631.9	53.5	448342	74.0	175740	
2.60.00	2.66	37643	1731.6	52.2	450468	76.1	172557	
2.62.00	3.03	40436	1836.2	50.9	452438	78.4	169373	
2.64.00	3.41	43343	1945.9	49.7	454209	80.7	166189	
2.66.00	3.85	46368	2061.2	48.5	455884	83.2	163004	
2.68.00	4.32	49512	2182.3	47.3	457375	85.7	159819	
2.70.00	4.86	52780	2309.3	46.2	458770	88.3	156633	
2.72.00	5.41	56175	2442.6	45.1	459977	91.0	153446	
2.74.00	5.97	59699	2582.2	44.1	461096	93.7	150259	
2.76.00	6.61	63356	2728.3	43.1	462080	96.6	147070	
2.78.00	7.30	67148	2881.0	42.1	462973	99.5	143881	
2.80.00	8.03	71080	3040.4	41.2	463739	102.5	140691	
2.82.00	8.80	75154	3206.7	40.3	464409	105.5	137500	
2.84.00	9.64	79373	3380.0	39.4	464986	108.6	134307	
2.86.00	10.52	83740	3560.3	38.6	465504	111.8	131114	
2.88.00	11.45	88257	3747.9	37.8	465962	115.1	127920	
2.90.00	12.46	92927	3942.9	37.0	466365	118.5	124725	
2.92.00	13.52	97753	4145.5	36.3	466690	122.0	121528	
2.94.00	14.64	102739	4356.0	35.6	466987	125.7	118331	
2.96.00	15.84	107891	4574.5	34.9	467264	129.5	115133	
2.98.00	17.10	113213	4801.4	34.3	467526	133.4	111933	
2.100.00	18.44	118711	5037.0	33.7	467779	137.6	108732	

102.00	19.85	124389	5281.7	33.1	468005	142.0	105530
104.00	21.33	130252	5536.1	32.6	468236	146.6	102326
106.00	22.90	136306	5800.6	32.0	468475	151.5	99121
108.00	24.56	142556	6075.7	31.5	468730	156.6	95913
110.00	26.29	149010	6362.2	31.0	469000	162.4	92703
112.00	28.11	155674	6660.8	30.6	469260	168.4	89491
114.00	30.04	162557	6972.2	30.1	469595	174.9	86277
116.00	32.05	169667	7297.6	29.7	469977	181.8	83059
118.00	34.18	177012	7638.0	29.3	470637	189.5	79838
120.00	36.40	184603	7994.8	28.9	471406	197.9	76612
122.00	38.75	192451	8369.6	28.5	472246	207.0	73379
124.00	41.20	200568	8763.9	28.1	473154	217.0	70139
BOOSTER CUTOFF							
125.53	43.17	206976	9080.4	27.8	473911	225.4	67653
126.53	44.48	211210	9104.4	27.7	80652	38.7	67386
127.53	45.80	215431	9128.6	27.5	80681	38.8	67118
BOOSTER JETTISON							
128.53	47.12	219641	9153.0	27.4	80713	39.0	66851
130.00	49.07	225802	9195.8	27.1	80259	43.7	59320
132.00	51.75	234105	9255.0	26.8	80320	44.1	58785
134.00	54.44	242490	9315.2	26.5	80380	44.5	58249
136.00	57.17	250771	9376.0	26.1	80480	44.9	57713
138.00	59.92	259007	9437.6	25.8	80615	45.4	57178
140.00	62.70	267194	9500.3	25.5	80734	45.9	56642
142.00	65.49	275334	9564.1	25.1	80814	46.3	56107
144.00	68.32	283424	9629.1	24.8	80870	46.8	55571
146.00	71.17	291468	9695.5	24.4	80917	47.3	55036
148.00	74.05	299464	9763.2	24.1	80956	47.8	54500
150.00	76.96	307414	9832.2	23.8	80989	48.2	53964
152.00	79.89	315320	9902.7	23.5	80993	48.7	53428
154.00	82.84	323182	9974.4	23.2	80984	49.2	52892
156.00	85.83	331001	10047.6	22.8	80977	49.7	52356
158.00	88.84	338780	10122.1	22.5	80970	50.2	51820
160.00	91.88	346517	10198.0	22.2	80963	50.7	51284
162.00	94.95	354216	10275.2	22.0	80957	51.3	50747
164.00	98.05	361878	10354.0	21.7	80952	51.8	50211
166.00	101.18	369503	10434.1	21.4	80946	52.4	49675
168.00	104.33	377093	10515.8	21.1	80941	52.9	49139
170.00	107.51	384649	10598.9	20.8	80937	53.5	48603
172.00	110.73	392174	10683.5	20.6	80932	54.1	48067
174.00	113.97	399668	10769.9	20.3	80927	54.7	47531
176.00	117.25	407132	10858.3	20.1	80923	55.4	46995
178.00	120.56	414570	10948.6	19.8	80919	56.0	46459
180.00	123.89	421983	11040.4	19.6	80914	56.6	45923
182.00	127.26	429371	11133.6	19.4	80910	57.3	45387
184.00	130.67	436737	11228.5	19.1	80906	58.0	44851
186.00	134.10	444082	11325.0	18.9	80902	58.7	44315
188.00	137.57	451407	11423.2	18.7	80898	59.4	43779
190.00	141.07	458714	11523.0	18.5	80894	60.1	43243
192.00	144.61	466006	11624.5	18.3	80890	60.9	42707
194.00	148.18	473283	11727.7	18.1	80886	61.7	42171
196.00	151.78	480548	11832.6	17.9	80883	62.4	41635
198.00	155.42	487802	11939.4	17.7	80879	63.3	41099
200.00	159.10	495048	12047.9	17.5	80875	64.1	40564

202.00	162.81	502287	12158.2	17.3	80872	64.9	40028
204.00	166.56	509522	12270.4	17.2	80868	65.8	39492
206.00	170.34	516755	12384.5	17.0	80865	66.7	38956
208.00	174.16	523988	12500.6	16.8	80862	67.7	38421
210.00	178.02	531223	12618.7	16.7	80858	68.6	37885
212.00	181.92	538462	12738.8	16.5	80855	69.6	37349
214.00	185.86	545708	12861.0	16.4	80851	70.6	36814
216.00	189.84	552963	12985.4	16.2	80848	71.6	36278
218.00	193.85	560230	13111.9	16.1	80845	72.7	35742
220.00	197.91	567511	13240.7	16.0	80841	73.8	35207
222.00	202.01	574808	13371.8	15.9	80838	74.9	34671
224.00	206.15	582126	13505.2	15.8	80835	76.1	34136
226.00	210.33	589466	13641.1	15.6	80832	77.3	33600
228.00	214.56	596831	13779.5	15.5	80829	78.6	33065
230.00	218.83	604225	13920.4	15.4	80826	79.9	32529
232.00	223.14	611650	14064.0	15.4	80823	81.2	31994
234.00	227.50	619110	14210.4	15.3	80820	82.6	31459
236.00	231.91	626608	14359.5	15.2	80817	84.0	30923
238.00	236.36	634146	14511.5	15.1	80815	85.5	30388
240.00	240.86	641730	14666.6	15.0	80812	87.0	29852
242.00	245.40	649362	14824.7	15.0	80809	88.6	29317
244.00	250.00	657047	14986.1	14.9	80807	90.2	28782
246.00	254.64	664788	15150.8	14.9	80804	92.0	28246
248.00	259.34	672589	15318.9	14.8	80801	93.7	27711
250.00	264.09	680455	15490.6	14.8	80799	95.6	27176
251.00	266.48	684413	15577.8	14.8	80798	96.5	26908
252.00	268.89	688390	15665.9	14.7	80797	97.5	26641
253.00	271.31	692384	15755.1	14.7	80795	98.5	26373
254.00	273.74	696398	15845.2	14.7	80794	99.5	26105
255.00	276.19	700430	15936.3	14.7	80793	100.5	25838
256.00	278.65	704484	16028.4	14.7	80792	101.6	25570
257.00	281.12	708558	16121.6	14.7	80791	102.6	25303
258.00	283.61	712653	16215.8	14.7	80790	103.7	25035
259.00	286.12	716771	16311.1	14.7	80789	104.9	24767
260.00	288.63	720910	16407.5	14.7	80788	106.0	24500
261.00	291.17	725015	16505.1	14.7	80787	107.2	24232
262.00	293.71	729262	16603.8	14.7	80786	108.4	23965
263.00	296.27	733474	16703.7	14.7	80785	109.6	23697
264.00	298.85	737712	16804.8	14.7	80784	110.8	23429
265.00	301.44	741977	16907.1	14.7	80783	112.1	23162
266.00	304.05	746258	17010.7	14.7	80782	113.4	22894
267.00	306.67	750587	17115.6	14.7	80781	114.8	22627
268.00	309.31	754934	17221.8	14.7	80780	116.1	22359
269.00	311.96	759311	17329.4	14.7	80779	117.5	22092
270.00	314.63	763718	17438.4	14.7	80778	119.0	21824
271.00	317.32	768156	17548.7	14.7	80777	120.5	21556
272.00	320.02	772627	17660.6	14.7	80776	122.0	21289
273.00	322.74	777130	17773.9	14.7	80775	123.5	21021
274.00	325.48	781666	17888.8	14.8	80775	125.1	20754
275.00	328.23	786238	18005.2	14.8	80774	126.7	20486
276.00	331.00	790845	18123.2	14.8	80773	128.4	20219
277.00	333.79	795488	18242.9	14.8	80772	130.1	19951
278.00	336.59	800169	18364.3	14.8	80771	131.9	19684
279.00	339.41	804889	18487.5	14.9	80770	133.7	19416
280.00	342.25	809649	18612.4	14.9	80769	135.6	19149
281.00	345.11	814449	18739.2	14.9	80769	137.5	18881
282.00	347.99	819291	18867.8	15.0	80768	139.5	18614
283.00	350.87	824137	19000.1	15.0	80767	141.5	18246

284.00	353.80	829106	19131.1	15.0	80766	143.6	18076
285.00	356.74	834081	19265.8	15.0	80765	145.8	17811
286.00	359.69	839103	19402.6	15.1	80765	148.0	17543
287.00	362.66	844173	19541.7	15.1	80764	150.3	17276
288.00	365.66	849292	19683.0	15.2	80763	152.6	17008
289.00	368.67	854461	19826.6	15.2	80762	155.1	16741
290.00	371.71	859683	19972.7	15.2	80761	157.6	16473
291.00	374.76	864959	20121.2	15.3	80759	160.2	16206
292.00	377.84	870239	20272.3	15.3	80758	162.9	15938
293.00	380.94	875677	20426.1	15.4	80757	165.6	15671
294.00	384.06	881122	20582.7	15.4	80755	168.5	15404
295.00	387.21	886628	20742.1	15.5	80753	171.5	15136
296.00	390.37	892195	20904.4	15.5	80751	174.6	14369
297.00	393.56	897825	21069.8	15.6	80749	177.8	14601
298.00	396.78	903521	21238.4	15.7	80747	181.1	14334
299.00	400.02	909264	21410.3	15.7	80744	184.5	14066
300.00	403.28	915116	21585.0	15.8	80394	187.3	13799
301.00	406.56	921019	21763.1	15.9	80390	190.9	13532
302.00	409.88	926995	21944.8	15.9	80385	194.8	13265
303.00	413.22	933046	22130.3	16.0	80380	198.8	12999

SUSTAINER CUTOFF

303.58	415.17	936604	22240.2	16.0	80376	201.2	12843
304.00	416.58	939166	22238.1	16.0	1270	3.2	12840
308.00	430.03	963611	22218.3	15.9	1270	3.2	12808
312.00	443.47	987902	22198.8	15.8	1270	3.2	12777
316.00	456.88	1012037	22179.6	15.8	1270	3.2	12745

VERNIER CUTOFF

317.90	463.23	1023423	22170.5	15.7	1270	3.2	12730
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NOSE LEFT DISPERSION

PREMATURE CUTOFF
PARAMETERS

TIME (SEC.)	GEOD. LAT. (DEG.)	LONG. (DEG.)	FREE-FALL DOWN-RANGE CROSS-RANGE		
			TIME (SEC.)	DISTANCE (N.MI.)	DISTANCE (N.MI.)
2.00	34.7960	120.5890	5.2	.0	.0
4.00	34.7960	120.5890	6.9	.0	.0
8.00	34.7960	120.5890	11.7	.0	.0
12.00	34.7959	120.5890	17.4	.0	.0
16.00	34.7957	120.5891	23.5	.0	.0
20.00	34.7954	120.5906	30.0	.0	.0
24.00	34.7948	120.5953	37.0	.0	.1
28.00	34.7938	120.6050	44.2	.8	.1
32.00	34.7923	120.6211	51.7	1.6	.2
36.00	34.7901	120.6449	59.5	2.8	.3
40.00	34.7871	120.6778	67.4	4.4	.5
44.00	34.7826	120.7197	75.2	6.5	.7
48.00	34.7754	120.7718	82.8	9.1	1.1
52.00	34.7661	120.8369	90.7	12.4	1.6
56.00	34.7542	120.9179	98.9	16.4	2.2
60.00	34.7394	121.0169	107.3	21.4	3.0
68.00	34.7198	121.2856	125.0	34.7	4.0
72.00	34.7113	121.4619	134.4	43.5	4.3
76.00	34.7022	121.6713	144.3	53.8	4.6
80.00	34.6920	121.9182	154.6	66.0	4.8
84.00	34.6802	122.2077	165.4	80.3	5.1
88.00	34.6658	122.5450	176.7	97.0	5.5
92.00	34.6476	122.9364	188.5	116.4	5.9
96.00	34.6248	123.3897	201.1	138.9	6.3
100.00	34.5962	123.9147	214.5	165.0	6.9
104.00	34.5604	124.5233	228.9	195.2	7.5
108.00	34.5154	125.2305	244.5	230.3	8.2
112.00	34.4585	126.0567	261.5	271.4	8.9
116.00	34.3854	127.0280	280.4	319.8	9.8
120.00	34.2900	128.1806	301.6	377.4	10.6
124.00	34.1628	129.5666	325.8	446.8	11.6
BOOSTER CUTOFF					
125.53	34.1027	130.1733	336.1	477.2	11.9
132.00	34.0522	130.6669	339.1	502.0	12.2
136.00	34.0330	130.9923	340.9	518.2	11.5
140.00	34.0249	131.3203	342.3	534.5	10.0
144.00	34.0201	131.6560	343.8	551.1	8.2
148.00	34.0154	132.0019	345.3	568.2	6.6
152.00	34.0098	132.3593	347.0	585.9	4.4
156.00	34.0032	132.7290	348.8	604.2	2.3
160.00	33.9954	133.1120	350.8	623.2	.2
164.00	33.9860	133.5091	353.0	642.9	-2.0
168.00	33.9745	133.9216	355.4	663.4	-4.3

172.00	33.9606	134.3505	358.0	684.7	-6.6
176.00	33.9348	134.7979	360.8	707.0	-8.5
180.00	33.8814	135.2624	364.0	730.4	-8.9
184.00	33.8175	135.7451	367.4	754.9	-9.0
188.00	33.7557	136.2506	371.1	780.4	-9.6
192.00	33.6926	136.7804	375.1	807.2	-10.4
196.00	33.6233	137.3356	379.4	835.3	-11.2
200.00	33.5461	137.9185	384.2	864.9	-11.9
204.00	33.4617	138.5317	389.3	896.0	-12.7
208.00	33.3698	139.1784	395.0	929.0	-13.5
212.00	33.2698	139.8619	401.1	963.9	-14.5
216.00	33.1600	140.5858	407.8	1000.9	-15.5
220.00	33.0389	141.3545	415.2	1040.3	-16.7
224.00	32.9050	142.1728	423.2	1082.4	-17.9
228.00	32.7564	143.0464	432.1	1127.4	-19.3
232.00	32.5906	143.9818	441.8	1175.8	-20.8
236.00	32.4051	144.9853	452.6	1227.9	-22.5
240.00	32.1962	146.0683	464.5	1284.4	-24.4
244.00	31.9598	147.2492	477.7	1345.7	-26.5
248.00	31.6906	148.5132	492.4	1412.8	-28.8
252.00	31.3823	149.9023	508.9	1486.3	-31.5
256.00	31.0268	151.4251	527.4	1567.5	-34.6
260.00	30.6135	153.1034	548.4	1657.6	-38.1
264.00	30.1290	154.9633	572.3	1758.4	-42.2
268.00	29.5558	157.0374	599.6	1871.9	-47.0
272.00	28.8707	159.3663	631.1	2000.8	-52.8
276.00	28.0423	162.0008	667.9	2148.6	-59.6
280.00	27.0279	165.0065	711.2	2319.9	-68.0
282.00	26.4333	166.6739	735.8	2416.2	-72.8
284.00	25.7684	168.4678	762.8	2520.8	-78.2
286.00	25.0215	170.4026	792.5	2635.0	-84.3
288.00	24.1792	172.4958	825.4	2759.9	-91.0
290.00	23.2254	174.7673	861.7	2897.3	-98.7
292.00	22.1401	177.2405	902.3	3048.9	-107.3
294.00	20.8995	179.9430	947.8	3217.1	-117.0
296.00	19.4745	-177.0920	999.1	3404.6	-128.1
298.00	17.8296	-173.8252	1057.2	3614.8	-140.7
300.00	15.9254	-170.2142	1123.5	3851.3	-155.1
302.00	13.7140	-166.2060	1199.6	4118.7	-171.3

SUSTAINER CUTOFF

303.58	11.7035	-162.6990	1268.2	4356.5	-185.7
304.00	11.6946	-162.6837	1268.1	4357.5	-185.7
306.00	11.6517	-162.6103	1267.6	4362.5	-186.0
308.00	11.6089	-162.5370	1267.1	4367.5	-186.3
312.00	11.5229	-162.3901	1266.1	4377.6	-186.9
316.00	11.4368	-162.2431	1265.0	4387.6	-187.5

VERNIER CUTOFF

317.90	11.3960	-162.1735	1264.6	4392.4	-187.8
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